

POWER SYSTEM INCIDENT REPORT TRIP OF 275 KV NORTH BUSBAR AT SOUTH EAST SUBSTATION – 18 SEPTEMBER 2010

PREPARED BY: ESOPP
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FINAL

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1 Introduction

At 2236 hrs on 18 September 2010, the 275 kV North busbar at South East Substation (SESS) in South Australia tripped off-loading the No.1 South East-Heywood (HYTS) 275 kV line as well as the No.1 275/132 kV transformer at SESS. No load was interrupted as a result of this trip.

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 or maintain power system security.

Information for this report has been provided by ElectraNet. Additional information has been obtained from AEMO's Energy Management System and Market Management System.

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

2 Summary of Events

Prior to the incident, there were two-day maintenance outages on the 275 kV North busbar at SESS, the No.1 SESS_HYTS 275 kV line, the No.1 South East 275/132 kV transformer and the Capacitor No.62. These transmission elements were returned into service at 1730 hrs on 18 September 2010.

At 2236 hrs on the same day, the 275 kV North busbar at SESS tripped on the operation of the North Bus Zone Set 2 auxiliary relay. This trip resulted in the off-loading of the No.1 SESS_HYTS 275 kV line, leaving South Australia transmission network connected to HYTS via a single circuit. The No.1 275/132 kV transformer at SESS was also offloaded. The circuit breakers 6603, 6604, 6605, and 6618 at SESS tripped during the incident. Weather conditions with light mist, rain and fog were recorded in the vicinity at the time of the event.

Three constraint sets were invoked by AEMO to maintain the power system security immediately following the event and the Market Notice 32845 was issued:

- F-I-HYSE: FCAS requirements for the outage of one SESS_HYTS 275 kV line
- I-HYSE: representing the outage of one SESS_HYTS 275 kV line
- S-SE_TX_1: representing the outage of a South East 275/132 kV transformer

Another Market Notice was subsequently issued (32846) to inform participants that due to the unplanned outage of 275 kV North busbar at SESS, South Australia (SA) region is likely to form an abnormal frequency island on the occurrence of a credible contingency event. LOR 2 condition was declared from 22:40 hrs on 18 September 2010.

ElectraNet advised AEMO that there was no power system disturbance identified at the time of the busbar trip. The exact cause of the operation of the North Bus Zone Set 2 auxiliary relay could not be readily established at this stage and ElectraNet isolated the North Bus Set 2 protection for investigation.

Refer diagrams 1 and 2 for an overview of the South East 275kV substation and connections to Heywood terminal station before and immediately after the event.

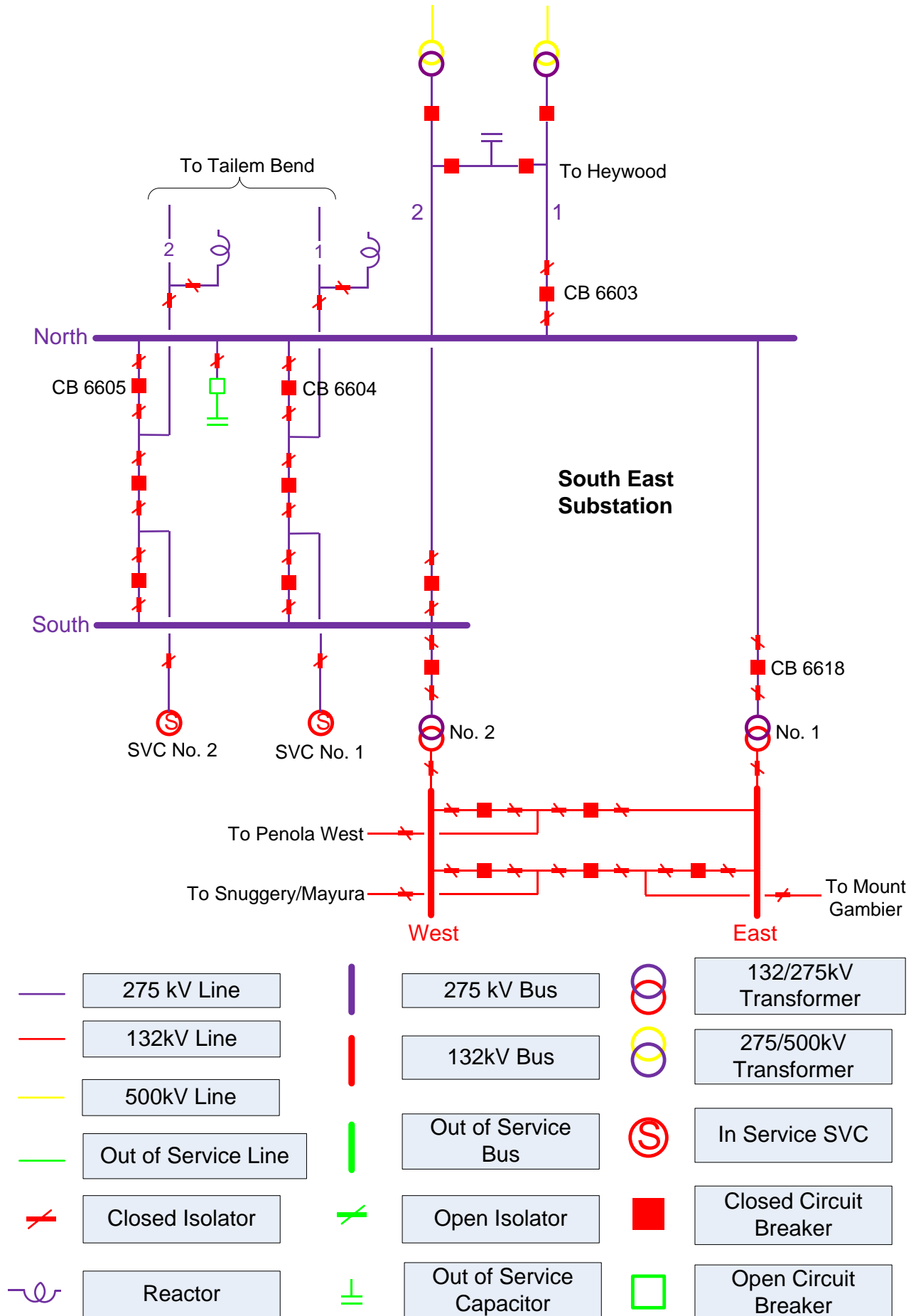


Figure 1 – South East substation switchyard before the event

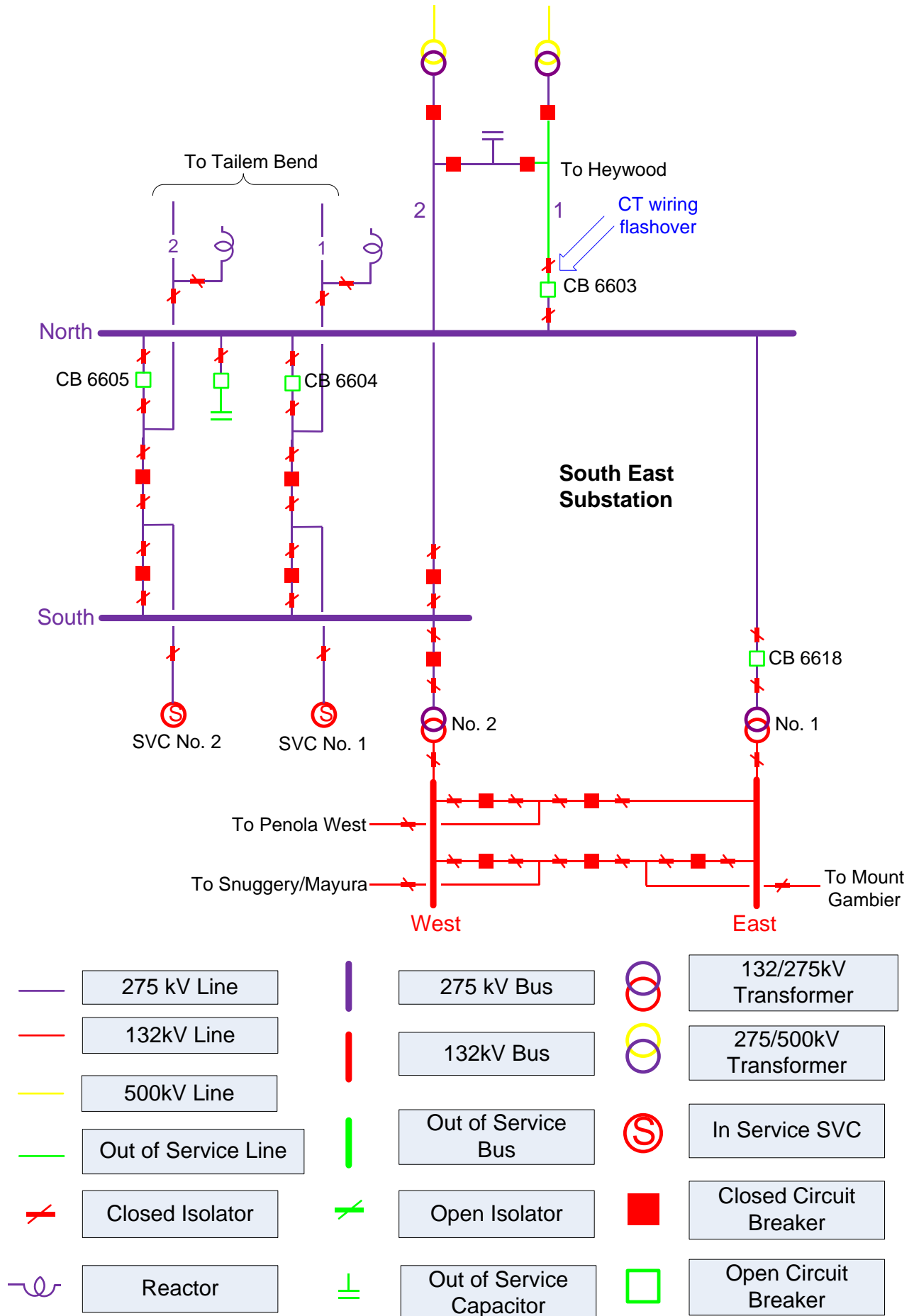


Figure 2 – South East substation switchyard immediately after the event

Protection staff were dispatched to South East substation at 2335 hrs for investigation of the protection operations but there was no evidence of a fault on secondary systems. The Set 2 auxiliary trip relay was then replaced as a precautionary measure.

AEMO gave permission to ElectraNet to restore the South East substation North bus at 0058 hrs on 19 September 2010. The No.1 SESS_HYTS 275 kV line was placed on load at this time. Constraints F-I-HYSE, I-HYSE, and S-SE_TX_1 were revoked and the actual LOR2 for SA was cancelled. Market Notices 32847 and 32848 were issued to notify participants of these activities.

Since the cause of the operation of the Set 2 auxiliary trip relay was unknown, the loss of 275kV North busbar at SESS was declared a credible contingency and the Market Notice 32849 was issued at 01:10 hrs on 19 September to inform participants. Consequently, the outages of 275 kV South busbar, No.2 SESS_HYTS 275 kV line, HYTS M2 transformer, CBs 6610, 6611, and No.2 275/132 kV transformer at SESS previously scheduled for 19 and 20 September, as well as the associated constraint equations, were withdrawn.

The reclassification of the loss of the 275 kV North busbar at SESS was cancelled by AEMO at 16:30 hrs on 19 September 2010 based on advice received from ElectraNet. Market Notice 32858 was issued.

3 Follow-up Actions

Further analysis of load current waveforms showed anomalies leading up to the initial trip. A second site inspection concentrating on the SESS_HYTS 275 kV line isolator was initiated on 20 September 2010 to check if there were any high resistance connections. This inspection revealed no issues on the primary circuit. However, examination of the CT 6603 marshalling cubicle in the switchyard showed that the CT connections belonged to Set 2 line protection of the No.1 SESS_HYTS 275 kV line were burned on all phases. ElectraNet isolated the No.1 SESS_HYTS 275 kV line to eliminate the risk of open circuit CTs causing further damage to wiring or the CT.

While replacing the damaged terminals and wiring in the CT 6603 marshalling cubicle, it was found that the Bus Zone protection wiring had also been damaged. It was concluded that a flashover of CT wiring in the CT 6603 marshalling cubicle would have caused a current spike in the North Bus Zone protection circuit, resulting in the operation of the North Bus Zone protection.

Damaged wiring and terminal blocks in CT 6603 marshalling cubicle were replaced. Complete testing of CT 6603 and all CT 6603 secondary circuits were completed by 25 September 2010.

4 Power System Security

The power system remained in a secure operating state for the duration of the incident.

Power system frequency remained within the normal operating frequency band during the event.

No load or generator was interrupted as a result of the busbar trip.

5 Conclusions

The tripping of 275 kV North busbar at South East substation off-loading the No.1 SESS_HYTS 275 kV line and the No.1 275/132 kV South East transformer was caused by a flashover of CT wiring in the CT marshalling cubicle.

This power system incident was efficiently managed by AEMO and ElectraNet, in accordance with the Rules.