

POWER SYSTEM OPERATING INCIDENT REPORT – TRIP OF STRATHMORE 275 KV SVC AND 877 CHALUMBIN – WOREE 275 KV LINE ON 17 MARCH 2012

PREPARED BY: Systems Capability

DATE: 17 March 2012

FINAL

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Abbreviations and Symbols

Abbreviation	Term
CB	Circuit Breaker
EMMS	Electricity Market Management System
EMS	Energy Management System
kV	Kilovolt
NER	National Electricity Rules
SVC	Thyristor Switched Capacitor
TSC	Static Var Compensator

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1 Introduction

At 1332 hrs on the 17 March 2012, the 877 Chalumbin – Woree 275 kV transmission line and the Strathmore 275 kV Static Var Compensator (SVC) tripped. There was no loss of supply or generation as a result of this incident.

This report has been prepared under clause 4.8.15 (c) 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 Powerlink. Data from AEMO's Energy Management System (EMS) and Electricity Market Management System (EMMS) has also been used in analysing the incident.

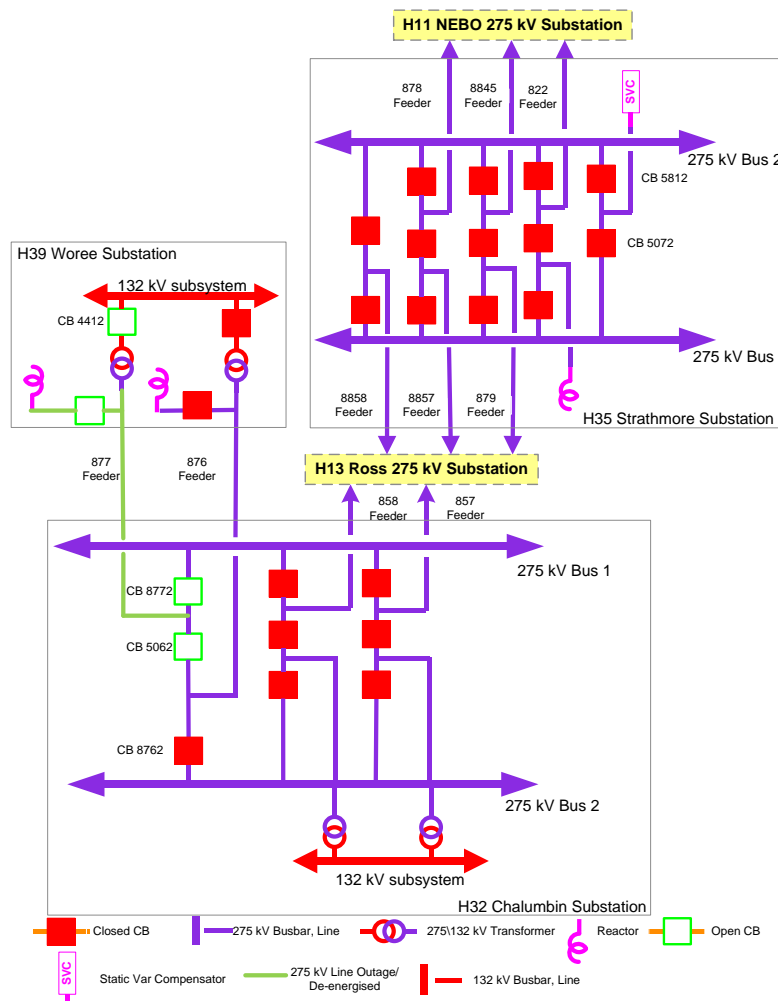
All references to time in this report are to National Electricity Market time (Australian Eastern Standard Time).

2 Pre-Contingent System Conditions

At 1016 hrs on 17 March 2012, the 877 Chalumbin – Woree 275 kV line tripped due to a high voltage fault on the line, and was being returned to service when the Strathmore SVC tripped.

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 the power system prior to the incident



3 Summary of Events

At 1016 hrs on 17 March 2012, the 877 Chalumbin – Woree 275 kV line tripped out of service¹ due to a high voltage fault.

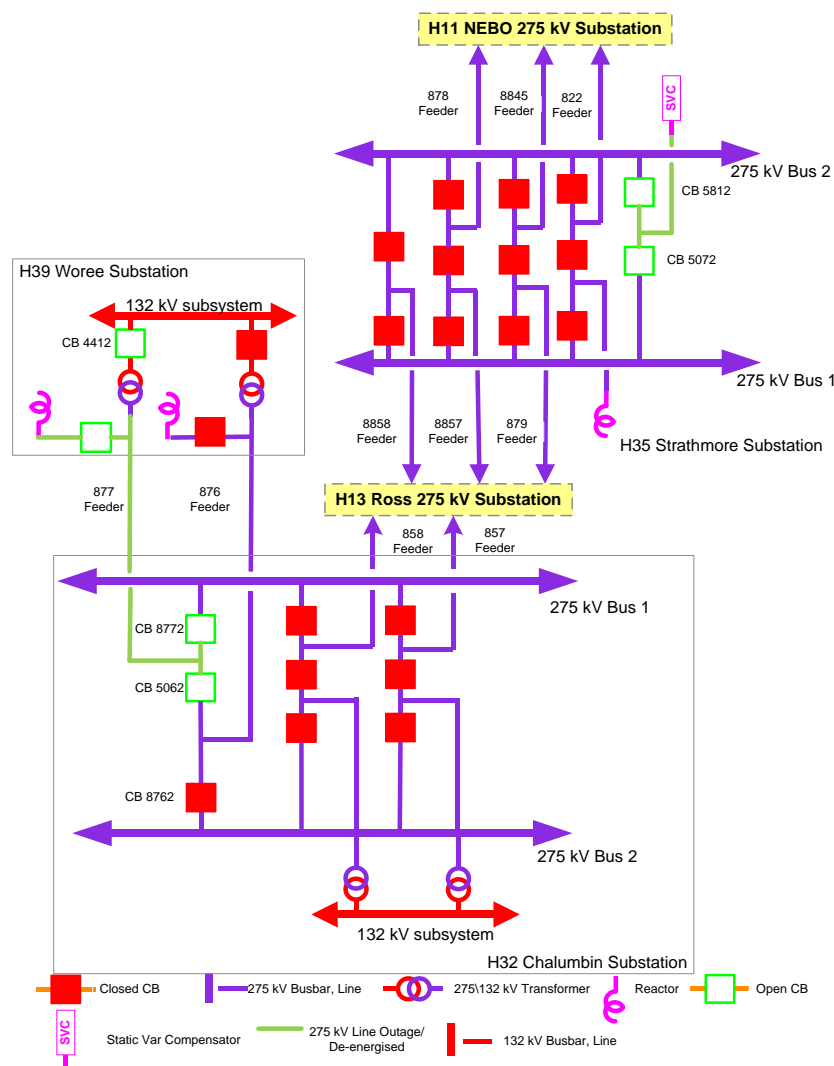
Powerlink patrolled selected areas of the line and did not locate any evidence of the fault.

At 1332 hrs, Powerlink re-energised 877 line by closing CB 8772 at Chalumbin substation, however CB 8772 immediately tripped due to the re-occurrence of the high voltage fault. Upon clearing this fault, the Strathmore SVC tripped due to a high voltage fault on a surge arrester associated with the SVC.

Both 877 line and the SVC remained out of service for investigation.

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

Figure 2 - Status of the power system immediately after the incident



4 Immediate Actions Taken

At 1340 hrs, AEMO invoked the constraint set 'Q-H35STM_SVC' to limit the central – northern Queensland intra-regional power transfer limit with the Strathmore SVC out of service.

At 1413 hrs, AEMO issued the Electricity Market Notice No.38416 advising the unplanned outage of the 275 kV Strathmore SVC and the invocation of the 'Q-H35STM_SVC' constraint set.

¹ The line does not have auto-reclose functionality as it includes a section of high voltage cable.

AEMO did not reclassify the loss of both the Strathmore SVC and the 877 line as a credible contingency event, as both equipment remained out of service until they were later repaired. This determination is consistent with section 12 of AEMO's Power System Security Guidelines².

5 Follow-up Actions

Powerlink identified a faulty insulator string as the cause for the fault on the 877 line. The string was replaced and the line was returned to service at 2029 hrs on 20 March 2012.

Powerlink investigations also revealed that the Thyristor Switched Capacitor (TSC) on the Strathmore SVC was automatically switched when a voltage dip occurred during the high voltage fault on the 877 line. When the high voltage fault on the 877 line was cleared, the voltage recovered and the SVC TSC automatically switched off.

When the SVC TSC switches off, the instantaneous voltage across the secondary components between the capacitors and the thyristors increases and then decays as the capacitors discharge.

However, for this incident, when the TSC switched off the increase in voltage resulted in a flashover of an insulator and the subsequent failure of a surge arrester, causing the trip of the SVC. Powerlink observed that pollution on the insulator caused the flashover. Appendix A shows the single line diagram for the Strathmore SVC and the location of the high voltage fault.

Powerlink will undertake routine monitoring of pollution build-up on the Strathmore SVC insulators until a permanent design solution is found. Powerlink confirmed that the Strathmore SVC is the only one of its design type installed in the Powerlink network.

At 1605 hrs on 21 March 2012, the Strathmore SVC was returned to service after the failed surge arrester was replaced, and at 1615 hrs AEMO revoked constraint set 'Q-H35STM_SVC'. The constraint set had no impact on central dispatch outcomes over the period it was invoked³.

6 Power System Security Assessment

Powerlink have confirmed that the high voltage faults on the 877 line and the Strathmore SVC were cleared within the fault clearance times specified in clause S5.1a.8 of the National Electricity Rules.

The power system voltages and frequency remained within the normal operating bands and the power system remained in a secure operating state throughout the incident.

There was no loss of supply or generation as a result of this incident.

7 Conclusions

At 1332 hrs on the 17 March 2012, the 877 line tripped on energising from Chalumbin substation due to a high voltage fault on the line. Upon clearing this fault, the Strathmore SVC tripped due to a high voltage fault on a surge arrester associated with the SVC.

There was no loss of supply or generation as a result of this incident.

AEMO is satisfied that Powerlink responded in a timely manner in investigating, identifying and rectifying the cause of the faults and in returning the 877 line and Strathmore SVC to service.

AEMO correctly applied the criteria published in section 12 of its Power System Security Guidelines in determining not to reclassify the loss as a credible contingency event.

² System Operating Procedure SO_OP3715 "Power System Security Guidelines" is available at the following webpage: <http://www.aemo.com.au/en/Electricity/Market-and-Power-Systems/System-Operating-Procedures/Power-System-Security-Guidelines-SOOP> <http://www.aemo.com.au/electricityops/3715.html>

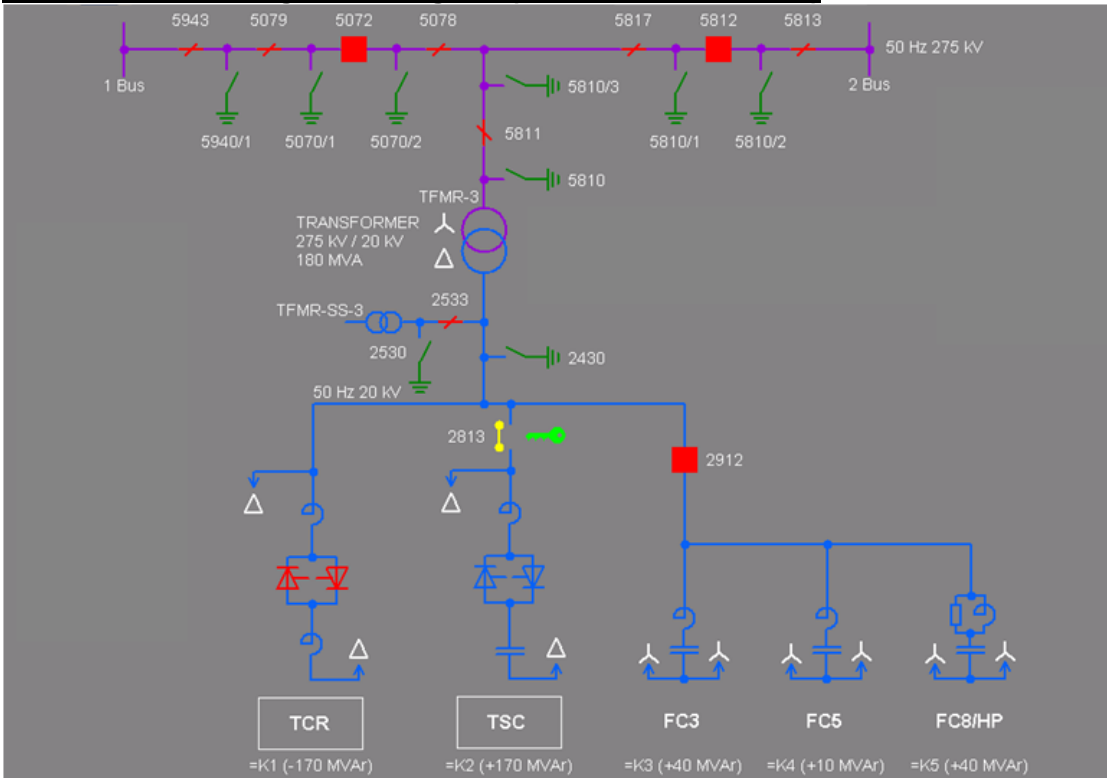
³ The constraint set was invoked from dispatch interval ended 1345 hrs on 17 March to dispatch interval ended 1615 hrs on 21 March,

8 Recommendations

There are no recommendations arising from this incident.

Appendix A

Strathmore SVC single line diagram (diagram provided by Powerlink)



TCR – Thyristor controlled reactor (170MVAR) – its output is infinitely controllable via variable thyristor firing angles

TSC – Thyristor controlled capacitor (170MVAR) – is switched fully ON or OFF by thyristors at current 0.

FC3, FC5, FC8 (total 90MVAR capacitance) – harmonic filters

TSC single line diagram (diagram provided by Powerlink)

