POWER SYSTEM INCIDENT REPORT: TRIP OF DOUBLE CIRCUIT MACKAY-COLLINSVILLE TEE - PROSERPINE 132 KV LINES AND STRATHMORE SVC ON 29 DECEMBER 2010

PREPARED BY: Electricity System Operations Planning and Performance

FINAL

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1 Introduction

At 1412 hrs on 29 December 2010 both Collinsville to Mackay tee Proserpine 7125 and 7126 132 kV lines tripped and auto-reclosed approximately 2 seconds later. The trips were most likely caused by a lightning strike.

Momentary interruption of approximately 55 MW of load supplied from the Proserpine 132kV substation occurred for the auto-reclose time of 7125 and 7126 lines.

Approximately two seconds after the trip of 7125 and 7126 lines the Strathmore static VAr compensator (SVC) tripped and remained out of service for one hour and 40 minutes.

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

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

Powerlink has provided relevant information to AEMO for this power system incident investigation. Data from AEMO's energy management and market systems has also been used in investigating the incident.

2 Pre-Contingent System Conditions

The status of the relevant power system equipment prior to the incident is shown in Figure 1. Before the incident 16 MW was flowing from Collinsville to Proserpine and 12 MW from Mackay to Proserpine on each of 7125 and 7126 lines. The Strathmore SVC was in service and absorbing 11 MVAr.

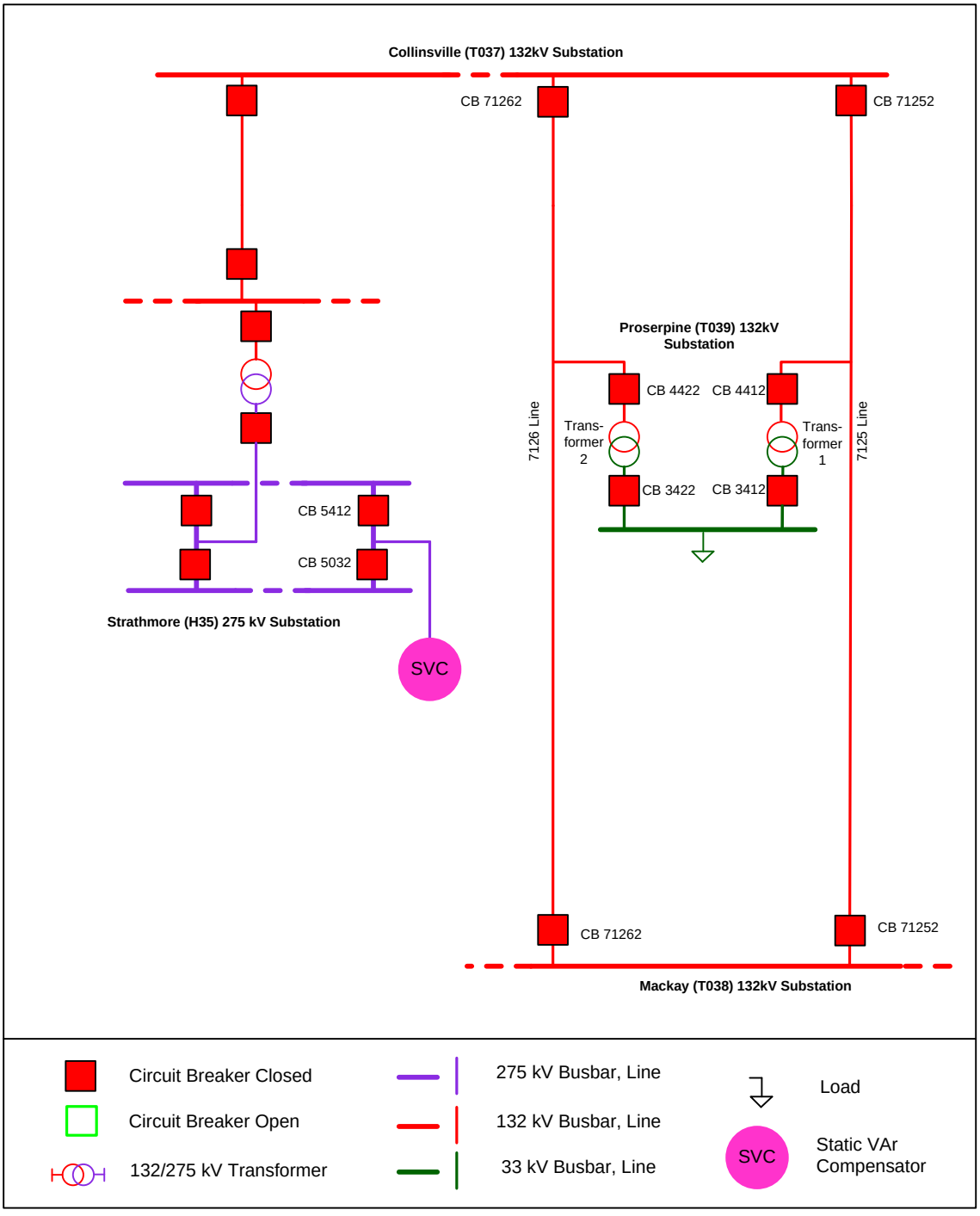

Figure 1 – Status of the power system prior to incident

3 Summary of Events

At 1412 hrs on 29 December 2010 the Collinsville to Mackay tee Proserpine 7125 and 7126 132kV lines tripped simultaneously resulting in the interruption of approximately 55 MW of load supplied from the Proserpine 132 kV substation.

The 7125 and 7126 lines successfully auto-reclosed at Collinsville, Mackay and Proserpine approximately two seconds after they had tripped, restoring all load supplied from the Proserpine 132 kV substation.

At 1412 hrs, approximately two seconds after the trip of the 7125 and 7126 lines, the Strathmore SVC also tripped.

The status of the relevant power system equipment following the auto-reclosing of 7125 and 7126 lines is shown in Figure 2.

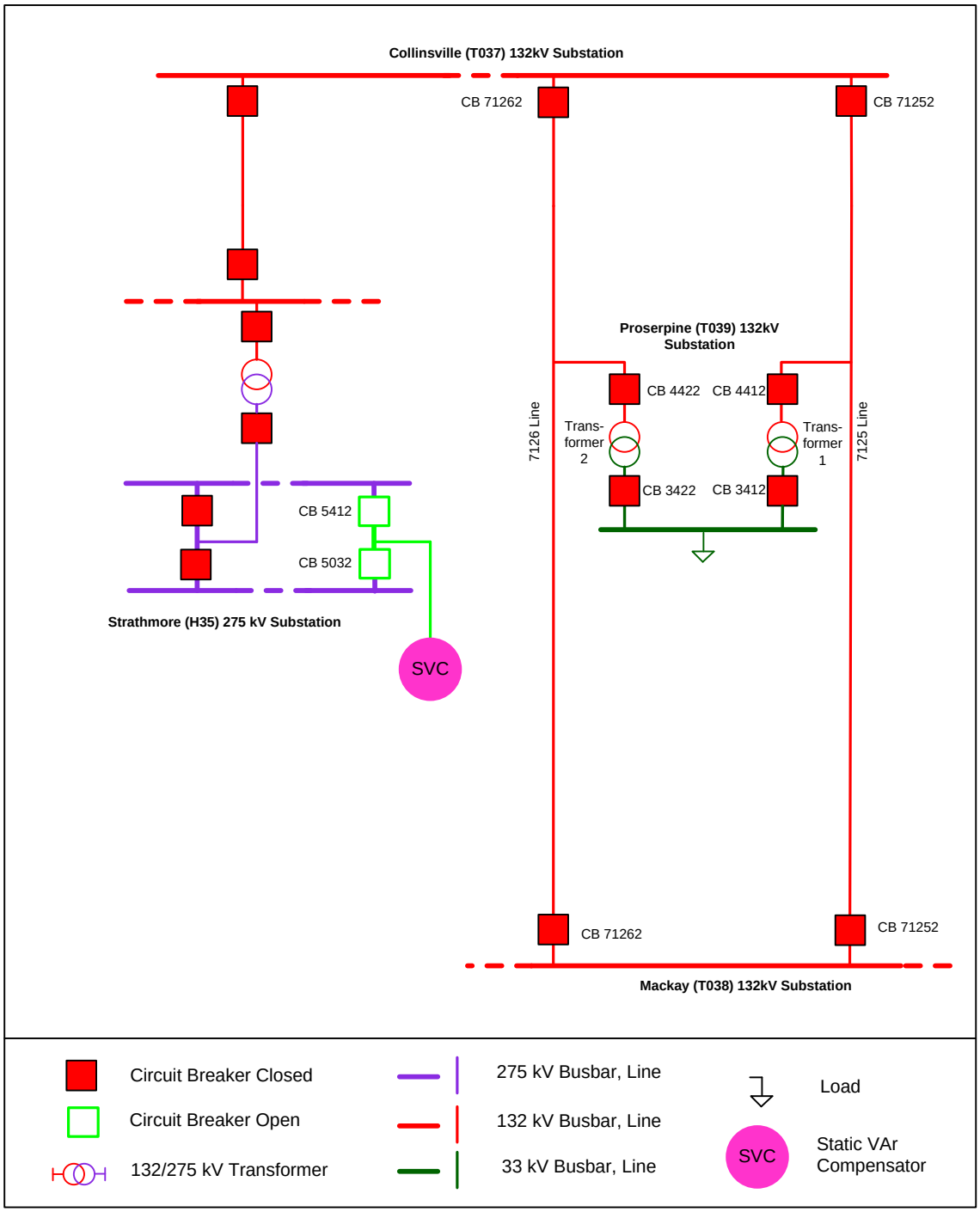

Figure 2 – Status of the power system following tripping and auto-reclosing of 7125 and 7126 lines

The Strathmore SVC was returned to service at 1552 hrs on 29 December 2010.

4 Power System Security Assessment

At 1320 hrs on 29 December 2010 the simultaneous loss of double circuit[1] transmission lines 7125 and 7126 was reclassified as a credible contingency event by AEMO (refer AEMO Market Notice No. 33868). The reclassification occurred as a lightning strike had been recorded within 20 km of 7125 and 7126 lines, which are listed as vulnerable transmission lines[2].

At 1412 hrs the distance protection systems at the Mackay, Proserpine and Collinsville 132 kV substations simultaneously detected high voltage faults on 7125 and 7126 lines. It is likely that the fault was caused by a lightning strike as the detection of the high voltage fault coincided with the detection of a lightning strike, by Powerlink's lightning tracker system, within the area of the line. Also the location of the fault as calculated by 7125 and line 7126 line protection systems was consistent with the location of the coincident lightning strike indicated by Powerlink's lightning tracker system.

The fault on 7125 line was cleared from the power system in 142 ms and the fault on 7126 line was cleared from the power system in 146 ms. Both faults were cleared within the requirements specified in the National Electricity Rules (NER)[3].

The 7125 and 7126 lines auto-reclosed approximately two seconds after they tripped. This restored all load at the Proserpine 132kV substation.

The Strathmore SVC tripped approximately two seconds after 7125 and 7126 lines tripped. At 1426 hrs AEMO invoked constraint set "Q-H35STM_SVC" for the period 1430 hrs to 1615 hrs to cover the Strathmore SVC outage, but the constraint equations had no impact on dispatch outcomes. The trip was initiated by the SVC's thyristor cooling protection system due to the loss of the power supply to the thyristor cooling system. The thyristor cooling system has two alternate power sources with automatic changeover functionality. The loss of the power supply occurred due to the automatic changeover function not operating as expected during the incident. Powerlink is currently investigating the initial loss of the power supply to Strathmore SVC's thyristor cooling system, and the subsequent failure of the power supply automatic changeover function.

Following inspection of the Strathmore SVC it was returned to service at 1552 hrs.

[1] Double circuit transmission lines are parallel transmission lines that share common transmission towers.

[2] "Vulnerable transmission lines" are double circuit transmission lines that have a significant risk of simultaneous tripping due to lightning strike. If a lightning strike is detected within 20 km of two "vulnerable transmission lines" then the loss of the double circuit is immediately reclassified as a single credible contingency. AEMO's operating procedures classify 7125 and 7126 lines as "vulnerable transmission lines". Refer AEMO operating procedure SO_OP 3715 Power System Security Guidelines, available at the following web page for further details:

http://www.aemo.com.au/electricityops/3715.html

[3] Schedule S5.1a.8 in the NER

At 1732 hrs AEMO issued Market Notice No. 33873 cancelling the reclassification of simultaneous loss of double circuit transmission lines 7125 and 7126 as a credible contingency event from 1730 hrs.

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

5 Follow-up Actions

Following the incident, initial testing by Powerlink of Strathmore SVC's power supply automatic changeover system found it to operate correctly. Powerlink will continue to investigate the initial loss of the power supply to Strathmore SVC's thyristor cooling system and the subsequent failure of the power supply automatic changeover system during this incident.

6 Conclusions

AEMO and Powerlink correctly reclassified the simultaneous loss of 7125 and 7126 lines as a credible contingency given the proximity of lightning in the area.

The simultaneous trip of 7125 and 7126 lines resulted from operation of distance protection to clear high voltage faults attributed to a lightning strike. Protection systems cleared the faults within the time required by the NER. The trips resulted in an interruption of approximately 55 MW of load supplied from the Proserpine 132kV substation. Load was restored approximately two seconds later when 7125 and 7126 lines automatically reclosed.

The Strathmore SVC tripped due to loss of the power supply to its thyristor cooling system.

7 Recommendations

Powerlink are to complete their investigation of the initial loss of the power supply to Strathmore SVC's thyristor cooling system and the subsequent failure of the power supply automatic changeover system, and report their findings to AEMO by 1 July 2011.