

POWER SYSTEM OPERATING INCIDENT REPORT: TRIP OF MULTIPLE TRANSMISSION LINES IN QUEENSLAND ON 28 JANUARY 2012

PREPARED BY: Electricity System Operations Planning and Performance

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FINAL

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Abbreviations and Symbols

Abbreviation	Term
kV	Kilovolt
MRNB	Moranbah Substation
ms	Millisecond
MW	Megawatt
NER	National Electricity Rules
NGY	North Goonyella
NLDS	Newlands Substation
SCK	Stony Creek Substation

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1 Introduction

At 1815 hrs on 28 January 2012, the 132 kV double circuit lines, 7122 Moranbah (MRNB) – Stony Creek (SCK) tee North Goonyella (NGY) and 7155 MRNB – Newlands (NLDS), simultaneously tripped out of service due to high voltage faults on both lines. The high voltage faults occurred during a period of severe lightning activity. At the time of the simultaneous faults a lightning strike was registered by Powerlink’s lightning tracker system in close proximity to the lines. Approximately 23 MW of load, comprising of load at SCK, NLDS and NGY, was interrupted 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.

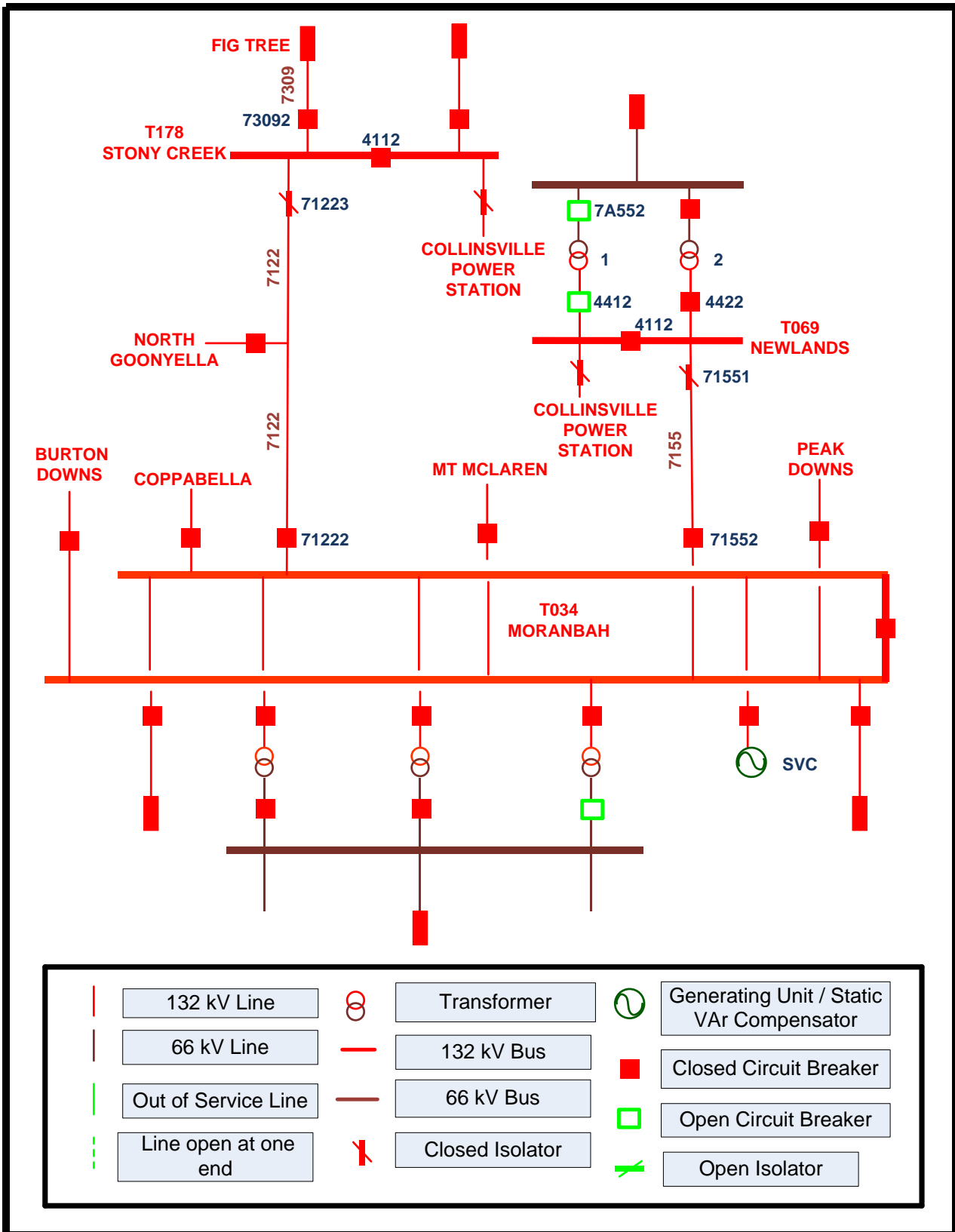
This report is largely based upon information provided by Powerlink. Data from AEMO’s Energy Management System and Electricity Market Management System has also been used in analysing the incident.

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

2 Pre Incident System Conditions

Prior to the incident, the No.1 132/66 kV transformer at NLDS was out of service and circuit breakers 4412 and 7A552 at NLDS were open. 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 1815 hrs on 28 January 2012, the protection systems of the 7155 and 7122 lines operated to clear high voltage faults on both lines, tripping both lines out of service. Refer to Figure 2 over-page for the status of the power system immediately after the incident. The trip of the 7155 line (resulting from the trip of circuit breakers 71552 at MRNB and 4112 and 4422 at NLDS) off-loaded the No.2 132/66 kV transformer at NLDS substation. The trip of the 7122 line (resulting from the trip of circuit breakers 71222 at MRNB and 4112 and 73092 at SCK) off-loaded the 7309 SCK – Fig Tree 132 kV line. NGY also experienced a momentary interruption to supply in the auto-reclose dead time of circuit breaker 4112 at SCK. Together the trip of the 7155 and 7122 lines resulted in the interruption of approximately 23 MW of load.

The high voltage faults occurred at a time when lightning activity was recorded in the lightning tracker system. The line protection systems estimated the fault locations at similar physical locations on each of the lines. Furthermore the fault location estimated by the line protection systems was consistent with the location of a lightning strike recorded by the lightning tracker system.

4 Immediate Actions Taken

Faults on both lines were cleared in 95 ms, which is within the required fault clearing time frames specified in the NER.

Five seconds after the trip, the 7122 line was successfully auto-reclosed at SCK by circuit breaker 4112. This restored supply to approximately 4 MW of load at NGY substation which had been interrupted for five seconds.

At 1826 hrs, the 7155 line and No.2 132/66 kV transformer at NLDS substation were returned to service. This restored supply to approximately 18 MW of load at NLDS which had been interrupted for 14 minutes.

At 1835 hrs, the 7122 line was re-energised at MRNB.

At 1841 hrs, the Fig Tree feeder (line 7309) was returned to service. This restored supply to approximately 1 MW of load on the Fig Tree feeder which had been interrupted for 26 minutes.

At 1930 hrs, AEMO issued the Electricity Market Notice No.37502 advising of the occurrence of this non-credible contingency event. AEMO applied its operating procedure SO_OP 3715 Power System Security Guidelines¹ in determining that the simultaneous trip of the 7122 and 7155 lines should immediately be re-classified as a credible contingency due to the detected lightning strike in the vicinity of the lines. In accordance with NER clause 4.2.3B, AEMO reclassified the simultaneous trip of the 7122 and 7155 lines as a credible contingency event from 1930 hrs.

Following operating procedure SO_OP 3715 Power System Security Guidelines, at 2145 hrs AEMO revoked the re-classification of the loss of the 7122 and 7155 lines as a credible contingency event. Electricity Market Notice No. 37505 was issued.

¹ Clause 4.2.3B of the NER requires that AEMO establish criteria to use when considering whether a non-credible contingency event is reasonably possible. This is published in AEMO operating procedure SO_OP3715 Power System Security Guidelines, which is available at:

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

In accordance with the operating procedure SO_OP 3715 Power System Security Guidelines, AEMO categorised the 7122 and 7155 132 kV parallel lines as vulnerable lines².

5 Power System Security Assessment

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

A total 23 MW of load (approximately 1 MW at SCK, 4 MW at NGY and 18 MW at NLDS) was interrupted as a result of this event.

² The future trip of vulnerable transmission lines is identified as being a probable event following a detected cloud to ground lightning strike in the vicinity of the lines.

6 Conclusions

It is likely that the simultaneous trip of the MRNB–NLDS and the MRNB–SCK tee NGY 132 kV lines was due to lightning. The faults that resulted from this incident were successfully cleared by Powerlink’s protection systems and power system security was maintained. A total 23 MW of load at SCK, NGY, and NLDS was interrupted as a result of the event.

AEMO correctly applied the criteria required by clause 4.2.3B of the NER and published in section 12 of its Power System Security Guidelines in assessing that the circumstances of this incident did warrant reclassifying similar incidents as a credible contingency event.

7 Recommendations

There are no recommendations arising from this incident.