

# POWER SYSTEM OPERATING INCIDENT REPORT – TRIP OF KEILOR NO.1 220 KV BUSBAR ON 29 MAY 2012

PREPARED BY:        Systems Capability

DATE:                 3 October 2012

FINAL

## Disclaimer

### 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 (NER).

### 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.

### 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.

## Abbreviations and Symbols

Abbreviation	Term
ATS	Altona Terminal Station
BLTS	Brooklyn Terminal Station
CB	Circuit Breaker
EMS	Energy Management System
EMMS	Electricity Market Management System
GTS	Geelong Terminal Station
KTS	Keilor Terminal Station
kV	Kilovolt
MW	Megawatt
MLTS	Moorabool Terminal Station
PTH	Point Henry Terminal Station
TTS	Thomastown Terminal Station
WMTS	West Melbourne Terminal Station

© 2012 Australian Energy Market Operator Ltd. All rights reserved

## 1 Introduction

At 1620 hrs on 29 May 2012, the No.1 220 kV busbar at Keilor terminal station (KTS) in Victoria tripped, following planned work by SP AusNet. The busbar was returned to service at 1739 hrs. There was no loss of generation or customer load.

This report has been prepared under clause 4.8.15 (c) of the National Electricity Rules (NER) to assess the adequacy in the provision of responses by facilities and services. The report also determines the appropriateness of actions taken to restore or maintain power system security.

This report is largely based upon information provided by SP AusNet<sup>1</sup>. 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

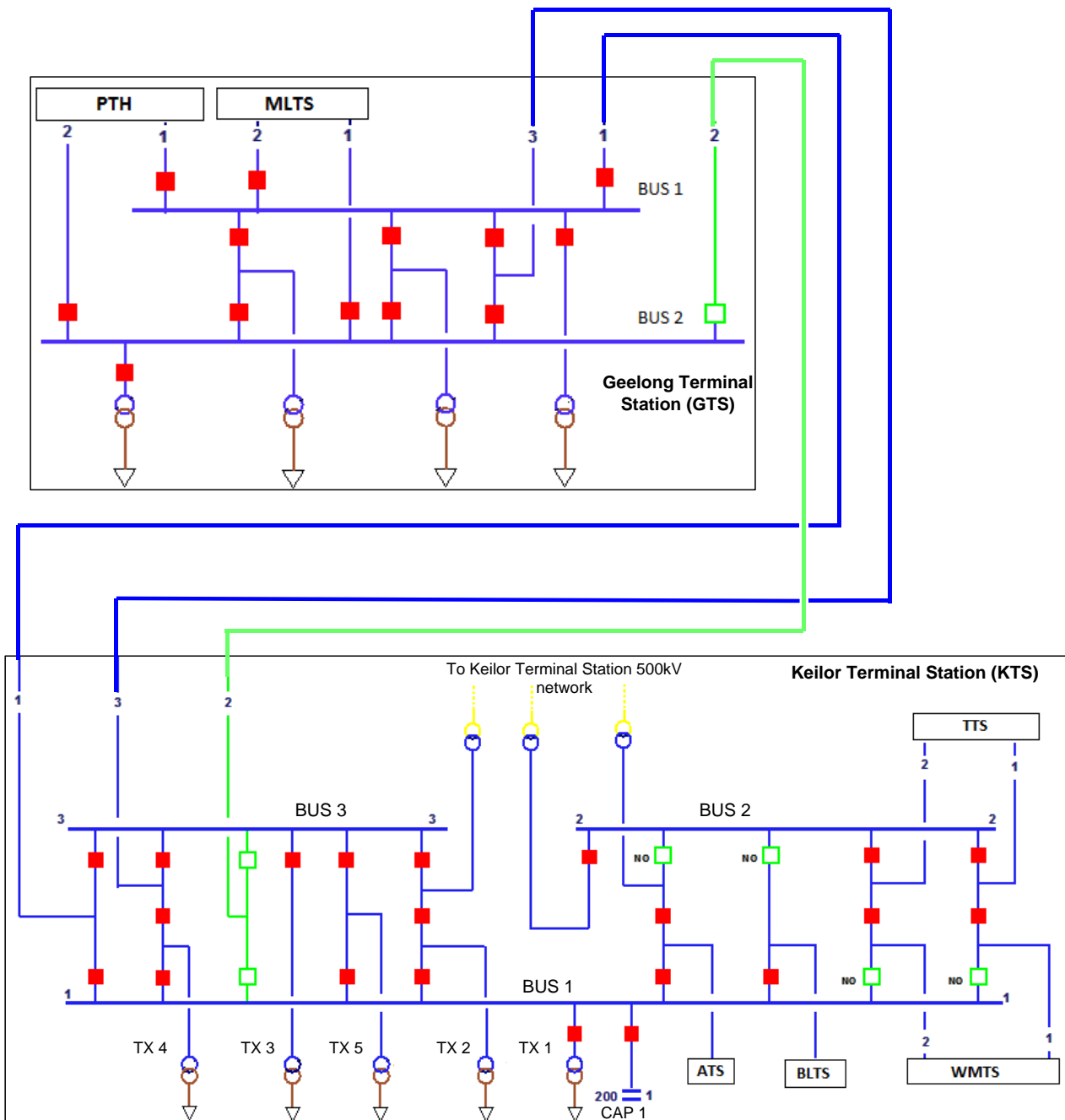
Prior to the incident all network components connected to the Keilor No.1 220 kV busbar were in service except the Keilor – Geelong No.2 220 kV line, which was out of service for planned maintenance including the overhaul of the line isolator at Geelong Terminal Station end.

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.

---

<sup>1</sup> Information provided by SP AusNet has been provided on a without prejudice basis and nothing in this report is intended to constitute, or may be taken by any person as constituting, an admission of fault, liability, wrongdoing, negligence, bad faith or the like on behalf of SP AusNet (or its respective associated companies, businesses, partners, directors, officers or employees).

Figure 1: Status of the power system prior to the incident



	Capacitor		220/66 kV Transformer		De-energised Busbar, Line		Fault
	Circuit Breaker Closed		500 kV Busbar, Line		Brooklyn Terminal Station		Point Henry Terminal Station
	Circuit Breaker Open		220 kV Busbar, Line		West Melbourne Terminal Station		Moorabool Terminal Station
	500/220 kV Transformer		66 kV Busbar, Line		Thomastown Terminal Station		Altona Terminal Station

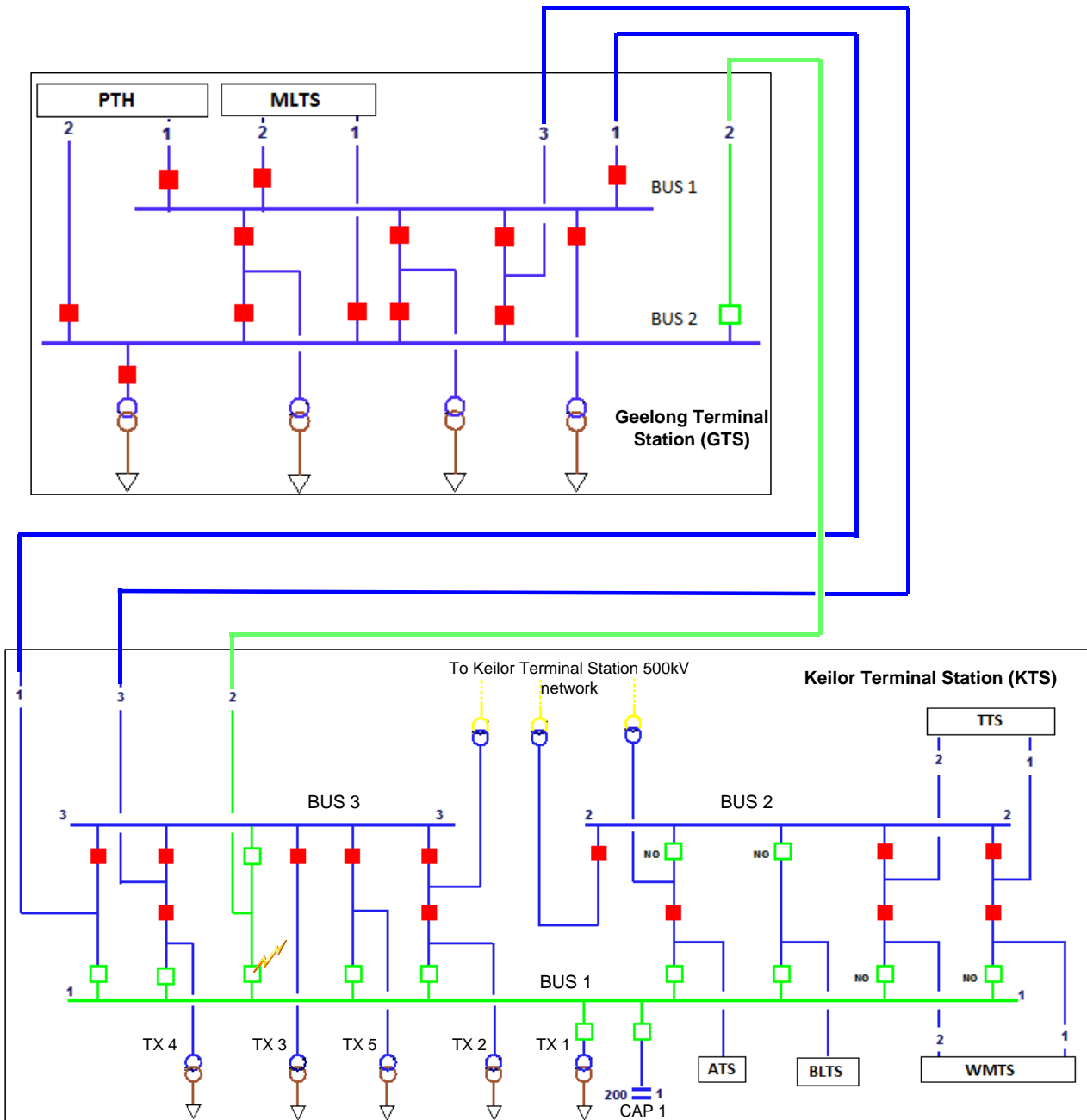
### **3 Summary of Events**

At 1619 hrs on 29 May 2012, SP AusNet commenced restoration of Keilor – Geelong No.2 220 kV line after the completion of planned outage work and the line was energised from the KTS end.

Approximately 2 seconds after the line was taken into load service by closing the line CB at the Geelong end, the bus protection system detected a blue phase to ground fault on the line section near to the Keilor No.1 220 kV busbar.

The fault was cleared by tripping all CBs on the Keilor No.1 220 kV busbar, which resulted in the off-loading of the Keilor – Brooklyn 220 kV line, the Keilor No.1 220 kV capacitor bank and the Keilor B1 220/66 kV transformer.

Figure 2: Status of the power system following the incident



	Capacitor		220/66 kV Transformer		De-energised Busbar, Line		Fault
	Circuit Breaker Closed		500 kV Busbar, Line		BLTS Brooklyn Terminal Station		PTH Point Henry Terminal Station
	Circuit Breaker Open		220 kV Busbar, Line		WMTS West Melbourne Terminal Station		MLTS Moorabool Terminal Station
	500/220 kV Transformer		66 kV Busbar, Line		TTS Thomastown Terminal Station		ATS Altona Terminal Station

## 4 Immediate Actions Taken

SP AusNet investigated the incident and found that Keilor No.1 220 kV busbar tripped by protection operation to clear a fault on the GTS No. 2 line No.1 Bus 220 kV CB, which developed shortly after energising the Keilor – Geelong No.2 220 kV line. The faulty CB was isolated and the busbar was returned to service at 1739 hrs.

The Keilor – Geelong No.2 220 kV line was returned to service at 1750 hrs.

At 1659 hrs, AEMO issued Electricity Market Notice No. 38920 to notify the market of this non-credible contingency event.

At 1814 hrs, AEMO issued Electricity Market Notice No. 38921 to advise the market that AEMO would not reclassify a similar event as a credible contingency, given the circumstances of the incident were unlikely to reoccur. The notice also advised that the Keilor No.1 220 kV busbar was returned to service at 1739 hrs.

## 5 Follow-up Actions

On 20 June 2012, SP AusNet completed replacement of the faulty GTS No.2 line No.1 bus 220 kV CB at KTS.

## 6 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.

The provision and response of facilities and services were adequate to maintain power system security.

## 7 Conclusions

At 1620 hrs on 29 May 2012, the Keilor No.1 220 kV busbar tripped to clear a fault on the GTS No 2 line No.1 Bus 220 kV CB, which developed shortly after taking the Keilor – Geelong No.2 220 kV line into load service following a planned outage.

There was no loss of generation or load, and power system security was maintained throughout the incident.

AEMO is satisfied that SP AusNet has carried out the appropriate work to mitigate the risk of a similar incident occurring in the future.

AEMO correctly applied the criteria published in section 12 of its Power System Security Guidelines<sup>2</sup> in assessing that the circumstances of this incident did not warrant reclassifying similar incidents as a credible contingency event.

## 8 Recommendations

There are no recommendations arising from this incident.

---

<sup>2</sup> 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\_OP 3715 Power System Security Guidelines, which is available at: <http://www.aemo.com.au/electricityops/3715.html>