Trip of the Keilor-South Morang 500 kV transmission line at the Keilor end on 24 January 2015

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| An aemo power system operating incident report for the national electricty market |

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INCIDENT CLASSIFICATIONS

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| --- | --- |
| Time and date and of incident | 1556 hrs Saturday 24 January 2015 |
| Region of incident | Victoria |
| Affected regions | Victoria |
| Event type | Other (not aligned with other Event Types) |
| Primary cause | Protection and Control |
| Generation Impact | Nil |
| Customer Load Impact | Nil |
| Associated reports | Nil |

ABBREVIATIONS

|  |  |
| --- | --- |
| Abbreviation | Term |
| AEMO | Australian Energy Market Operator |
| KTS | Keilor Terminal Station |
| KTS-SMTS Line | The Keilor Terminal Station to South Morang Terminal Station 500 kV transmission line |
| kV | Kilovolt |
| NER | National Electricity Rules |
| SMTS | South Morang Terminal Station |

IMPORTANT NOTICE

Purpose

AEMO has prepared this document to provide information about this particular Power System Operating Incident.

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# Overview

This report reviews a power system operating incident that occurred on 24 January 2015 at Keilor Terminal Station (KTS) in Victoria. This incident involved the trip at one end of a 500 kV transmission line. No customer load was lost as a result of this incident and the transmission line was returned to service five minutes after the initial trip.

AEMO is required to assess power system security over the course of this incident as the incident is classified as a non-credible contingency that under the National Electricity Rules (NER).[[1]](#footnote-1) Specifically, AEMO is required 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.[[2]](#footnote-2)

AEMO concluded that:

* A faulty protection relay caused a 500 kV transmission line to open at one end. The issue was resolved by replacing the faulty protection relay.
* Power system security was maintained over the course of the incident.

This report is based on information provided by AusNet Services[[3]](#footnote-3) (AusNet) and AEMO. National Electricity Market time (Australian Eastern Standard Time) is used in this report.

# The Incident

On Saturday 24th January 2015, at 1556 hrs, the KTS to South Morang Terminal Station (SMTS) 500 kV transmission line (KTS-SMTS Line) opened at the KTS end and de-loaded the KTS-SMTS Line. The line was returned to service five minutes later at 1601 hrs. No customer load or generation was lost as a result of this incident. See Appendix 1 for a power system diagram illustrating the incident and a chronological log of the incident.

The reason for investigating this incident is that the KTS-SMTS Line opened at one end only. Generally transmission lines are expected to open at both ends under fault conditions. The opening of a transmission line at one end is an unexpected event identified as a non credible contingency.[[4]](#footnote-4)

# AusNet Investigation

AusNet investigated this incident and found that a faulty protection relay caused the KTS-SMTS Line to open at the KTS end.

AusNet found that circuit breakers at the KTS end of the line had opened in the absence of a fault. AusNet then analysed event records from both KTS and SMTS and identified the Y protection current differential protection system as faulty.

AusNet disabled the Y protection current differential protection system from service to further investigate the problem. At this time, the Y protection relay distance protection function remained in service along with X protection to provide two in-service protection systems.[[5]](#footnote-5)

AusNet found that a faulty current differential protection relay at SMTS had caused the incident. On 3 February AusNet replaced the faulty relay and returned the current differential protection system to service.

# Power System Security

This section assesses how power system security was managed over the course of the incident.[[6]](#footnote-6)

Immediately after the trip of the KTS-SMTS Line the power system was in a secure state so AEMO did not need to take any action. At 1601 hrs AusNet reclosed the opened circuit breakers a KTS to return the KTS-SMTS Line to service. At 17:16 hrs AEMO issued Market Notice 47883 to notify the market of the incident.[[7]](#footnote-7)

AEMO then assessed whether or not to reclassify the event as a credible contingency.[[8]](#footnote-8) At this time, the cause of the incident had not yet been identified so AEMO considered that the incident could reoccur. AEMO thereby reclassified the incident as a credible contingency and issued Market Notice 47889 at 2216 hrs, the same day, to notify the market of this reclassification.

AEMO cancelled the reclassification on 17 Feb 2015 and issued Market Notice 48197 to notify thte market of the cancellation. This followed notification from AusNet that the faulty protection relay had been replaced and that the Y current differential protection had been returned to service.

For this incident the power system remained in a secure operating state over the course of the incident. AEMO correctly assessed the incident, reclassified the incident as a credible contingency, and issued appropriate notifications.

# Conclusions

AEMO concluded that:

1. The KTS-SMTS Linetripped due to a failed current differential protection relay at the SMTS end of the KTS-SMTS Line.
2. The failed current differential protection relay at the SMTS end of the KTS-SMTS Line was replaced.
3. The provision and response of facilities and services were appropriate and power system security was maintained over the course of the incident.

# Appendix 1 – Power System Diagram and Event Log

The diagram below shows the KTS-SMTS line open at the KTS end.





Incident Log

|  |  |
| --- | --- |
| Time and Date | Event |
| 1556 hrs 24 Jan 2015 | KTS-SMTS Line opened at the KTS end |
| 1601 hrs 24 Jan 2015 | KTS-SMTS Line returned to service |
| 1716 hrs 24 Jan 2015 | Market Notice 47883 issued. Notification of Non-Credible Contingency Event |
| 2216 hrs 24 Jan 2015 | Market Notice 47889 issued. AEMO reclassified the incident as a credible contingency |
| 3 Feb 2015 | AusNet replaced faulty relay |
| 17 Feb 2015 | AusNet notified AEMO that the current differential relays had been replaced at KTS and SMTS |
| 1700 hrs 17 Feb 2015 | AEMO cancelled the reclassification of the incident. Market Notice 48197 issued. |

1. Clause 4.8.15(a)(1)(i) and AEMC Reliability Panel Guidelines for Identifying Reviewable Operating Incidents. [↑](#footnote-ref-1)
2. NER Clause 4.8.15 (b) [↑](#footnote-ref-2)
3. AusNet Services is a Transmission Network Service Provider in Victoria. Information provided by AusNet Services 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 AusNet Services (or its respective associated companies, businesses, partners, directors, officers or employees). [↑](#footnote-ref-3)
4. NER Clause 4.2.3 - Credible and non-credible contingency events; *AEMO Power System Security Guidelines,* Section 10 - Definition of a non-credible contingency events [↑](#footnote-ref-4)
5. The NER S5.1.9(c) requires Network Service Providers to provide primary and back-up protection systems [↑](#footnote-ref-5)
6. AEMO is responsible for power system security in the NEM and is required to operate the power system in a secure operating state (NER Clause 4.2.4 (a)). AEMO must thereby ensure that the power system is maintained in, or returned to, a secure operating state following a contingency event. [↑](#footnote-ref-6)
7. AEMO is required to notify the Market of a non-credible contingency event within two hours of the event - AEMO, *Power System Security Guidelines,* Section 10.3 [↑](#footnote-ref-7)
8. AEMO is required to assess whether or not to reclassify a non credible contingency event as a credible contingency - NER Clause 4.2.3A (c)) - and to report how re-classification criteria were applied - NER Clause 4.8.15 (ca). AEMO has to determine if the condition that caused the non-credible contingency event has been resolved. [↑](#footnote-ref-8)