TRIP OF THE MORTLAKE – HEYWOOD – ALCOA 500 KV LINE AND ALCOA No. 1 500 KV BUSBAR ON 24 OCTOBER 2017

REVIEWABLE OPERATING INCIDENT REPORT UNDER THE NATIONAL ELECTRICITY RULES

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AEMO
AUSTRALIAN ENERGY MARKET OPERATOR

INCIDENT CLASSIFICATIONS

Classification	Detail
Time and date of incident	1812 hrs on Tuesday 24 October 2017
Region of incident	Victoria
Affected regions	Victoria
Event type	Protection relay mal-operation
Generation impact	Nil
Customer load impact	Nil
Associated reports	Pricing event report

IMPORTANT NOTICE

Purpose

AEMO has prepared this report in accordance with clause 4.8.15(c) of the National Electricity Rules, using information available as at the date of publication, unless otherwise specified.

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1. OVERVIEW

This report relates to a reviewable operating incident[1] that occurred on 24 October 2017 in Victoria. This incident involved the outage of the Mortlake – Heywood – Alcoa 500 kV transmission line (MOPS-HYTS-APD line) and the APD No. 1 500 kV busbar.

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

As this was a reviewable operating incident, AEMO is required to assess power system security over the course of this incident, and 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].

AEMO has concluded that:

- The root cause of the incident was a faulty line protection relay at APD. The cause of the failure has been identified.
- There was no high voltage fault on the power system.
- AEMO took all required actions, in a timely manner, to return the power system to a secure operating state.
- AEMO correctly determined that reclassification was not required.

This report is prepared in accordance with clause 4.8.15(c) of the National Electricity Rules (NER). It is based on information provided by AusNet Services (AusNet)[3] and from AEMO Energy Management Systems.

National Electricity Market (NEM) time (Australian Eastern Standard Time) is used in this report. Local time in Victoria at the time of this incident is AEST plus one hour.

2. THE INCIDENT

At 1812 hrs on 24 October 2017, the MOPS-HYTS-APD line and the APD No. 1 500kV bus bar tripped simultaneously.

The MOPS-HYTS section of the line was returned to service at 2019 hrs on 24 October 2017. The APD No. 1 500 kV busbar and the HYTS-APD section of the line were returned to service at 2158 hrs on 25 October 2017, after replacement of a faulty protection relay at APD.

As the trip of the line and the busbar is not an expected event, this was a non-credible contingency event and hence a reviewable operating incident. In accordance with clause 4.8.15 of the NER, AEMO is required to review and report on any reviewable operating incident.

3. AUSNET INVESTIGATION

The following is based on information provided by AusNet as transmission network service provider (TNSP) of the area in question.

The MOPS-HYTS-APD line and the APD No. 1 500 kV busbar tripped as a result of a faulty ‘X’ Current Differential protection relay at APD on the HYTS-APD section of the line. There was no high voltage fault on the power system.

[1] See NER clause 4.8.15, and the AEMC Reliability Panel Guidelines for Identifying Reviewable Operating Incidents.
[2] See NER clause 4.8.15(b).
[3] AusNet Services is the transmission network service provider (TNSP) in the Victoria region. “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).”

An internal fault in the line protection relay resulted in the relay initiating a circuit breaker (CB) fail function in relation to CB 5100, which in turn initiated inter-trip signals to the line CBs at HYTS and MOPS and tripping of the No. 1 500 kV busbar at APD. As no other protection had operated and the relay contacts for tripping of CB 5100 were not initiated, this CB did not open.

The faulty relay was isolated and the MOPS-HYTS section of the line was returned to service at 2019 hrs on 24 October 2017.

The faulty relay was replaced[4] and the No. 1 500 kV busbar and the HYTS-APD section of the line were returned to service at 2158 hrs on 25 October.

This type of relay has not recorded a similar failure mode in the past. The faulty relay was sent to the manufacturer for further tests, with the relay manufacturer confirming a software failure due to a processor internal memory issue.

4. POWER SYSTEM SECURITY

AEMO is responsible for power system security in the NEM. This means AEMO is required to operate the power system in a secure operating state to the extent practicable, and take all reasonable actions to return the power system to a secure state following a contingency event, in accordance with the NER[5].

This section assesses how AEMO managed power system security over the course of this incident.

The power system was in a secure operating state prior to this incident. AEMO took the following steps, to return the power system to a secure operating state immediately after the incident

- Invoked constraint sets V-HYMO[6], S-X_BC_CP[7] and F-V-HYMO[8].
- Requested AusNet to open the HYTS No. 1 line – 2 Bus 500 kV CB at Tarrone[9].
- Requested AusNet to operate the HYTS transformers in manual mode[10].
- Requested ElectraNet[11] to bypass the series capacitors at Black Range.

The above actions were reversed when the MOPS-HYTS line was returned to service at 2019 hrs on 24 October 2017.

4.1 Reclassification[12]

When the APD No. 1 500 kV busbar was returned to service on 25 October 2017, AEMO assessed whether to reclassify the simultaneous loss of the MOPS-HYTS-APD line and the APD No. 1 500 kV busbar as a credible contingency. As AusNet had advised AEMO the cause of the incident had been identified and corrective action taken, AEMO determined that reclassification was not required.

5. MARKET INFORMATION

AEMO is required by the NER and operating procedures to inform the market about incidents as they progress. This section assesses how AEMO informed the market[13] over the course of this incident.

[4] While the line CB is owned and operated by Alcoa, the line protection relays are owned by AusNet.
[5] Refer to AEMO's functions in section 49 of the National Electricity Law and the power system security principles in clause 4.2.6 of the NER.
[6] Out = HYTS-MOPs No2 line.
[7] Both Black Range series capacitors bypassed.
[8] Out = HYTS-MOPS No2 line – FCAS requirements.
[9] Prevents Macarthur wind farm remaining connected to APD and South Australia on the contingent outage of the Moorabool – Tarrone 500 kV line.
[10] Prevents undesirable tap changing on the contingent outage of the Moorabool – Tarrone 500 kV line.
[11] ElectraNet is the Transmission Network Service Provider (TNSP) in South Australia.
[12] See NER clause 4.8.15(ca)
[13] AEMO generally informs the market about operating incidents as they progress by issuing Market Notices – see AEMO website: http://www.aemo.com.au/Electricity/National-Electricity-Market-NEM/Market-notices-and-events.

For this incident AEMO was required to inform the market on the following matters:

- A non-credible contingency event – notify within two hours of the event[14].
  - AEMO issued Market Notice 59597 at 1851 hrs on 24 October 2017, 39 minutes after the incident.
- Constraints invoked with interconnector terms on the left hand side (LHS)[15].
  - AEMO issued Market Notice 595594 at 1826 hrs on 24 October 2017.
- Updates to the non-credible contingency event – as information becomes available[16].
  - AEMO issued Market Notice 59599 at 2038 hrs on 24 October 2017.

AEMO issued all required market advices in relation to this incident.

6. CONCLUSIONS

AEMO has assessed this incident in accordance with clause 4.8.15(b) and (ca) of the NER. In particular, AEMO has assessed the adequacy of the provision and response of facilities or services, and the appropriateness of actions taken to restore or maintain power system security and how the reclassification criteria was assessed and applied.

AEMO has concluded that:

- The root cause of the incident was a faulty line protection relay at APD. The cause of the failure has been identified.
- There was no high voltage fault on the power system.
- AEMO took all required actions, in a timely manner, to return the power system to a secure operating state.
- AEMO correctly determined that reclassification was not required.

[14] 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.
[15] For a short-term outage, AEMO is required to notify the market of variances to interconnector transfer limits – AEMO, *Power System Security Guidelines,* Section 22.
[16] AEMO is required to notify the Market as it becomes aware of new and material information – NER Clause 4.2.3A(d).