AEMO
AUSTRALIAN ENERGY MARKET OPERATOR

# Trip of 5A3 and 5A5 lines on 17 February 2020

**August 2020**

Reviewable Operating Incident Report under the National Electricity Rules

## INCIDENT CLASSIFICATIONS

| Classification | Detail |
|---|---|
| Time and date of Incident | 0519 hrs 17 February 2020 |
| Region of incident | New South Wales |
| Affected regions | New South Wales |
| Event type | Environmental – lightning |
| Generation impact | No generation was disconnected as a result of this incident |
| Customer load impact | No customer load was disconnected as a result of this incident |
| Associated reports | Nil |

## ABBREVIATIONS

| Abbreviation | Term |
|---|---|
| AEMC | Australian Energy Market Commission |
| AEMO | Australian Energy Market Operator |
| AEST | Australian Eastern Standard Time |
| kA | Kiloampere |
| kV | Kilovolt |
| NEM | National Electricity Market |
| NER | National Electricity Rules |
| TNSP | Transmission Network Service Provider |

# 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 17 February 2020 in New South Wales. The incident involved the simultaneous trip of Mount Piper – Bayswater 5A3 500 kV line (5A3 line) and Mount Piper – Wollar 5A5 500 kV transmission lines (5A5 line).

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 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:

1. The trip of the 5A3 and the 5A5 lines was due to lightning, and all protections operated as designed and as expected to clear the fault.
2. AEMO correctly reclassified the simultaneous trip of the 5A3 and the 5A5 lines as a credible contingency after the incident.
3. AEMO now considers the 5A3 and the 5A5 lines to be vulnerable transmission lines with a category of Probable[3] due to lightning.
4. The power system remained in a secure operating state throughout this incident.

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 TransGrid[4] and AEMO.

National Electricity Market (NEM) time (Australian Eastern Standard Time [AEST]) is used in this report.

# 2. The incident

## 2.1 Pre-incident conditions

The 5A3 and 5A5 lines between Wollar and Mount Piper share common towers (referred to as a double circuit). Prior to the incident, there was the lightning activity in the vicinity of the 5A3 and 5A5 lines.

As there has been no history of a simultaneous trip of both 5A3 and 5A5 lines due to lightning, AEMO was not required to reclassify simultaneous trip of the 5A3 and 5A5 lines prior to the incident.

## 2.2 The incident

At 0519 hrs on 17 February 2020, the 5A3 and the 5A5 lines simultaneously tripped and successfully auto reclosed after 15 seconds.

[1] See NER clause 4.8.15(a)(1)(i), as the event relates to a non-credible contingency event; and the AEMC Reliability Panel Guidelines for Identifying Reviewable Operating Incidents.

[2] See NER clause 4.8.15(b).

[3] AEMO categorise double circuit transmission lines as Possible, Probable or Proven with respect of the likelihood of lightning trip – AEMO, Power System Security Guidelines, Section 8.4.

[4] TransGrid is the Transmission Network Service Provider (TNSP) for New South Wales.

## 2.3 TransGrid investigation

The following is based on information provided by TransGrid.

### 2.3.1 Trip of 5A3 and 5A5 lines

Both faults on the 5A3 and the 5A5 lines were caused by a white phase to earth fault. Distance to fault locations indicated that the faults were at approximately 37 km from Mount Piper.

TransGrid advised that there was a single lightning strike near the fault location on the 5A3 and 5A5 lines at the time of the incident. The single lightning strike had an approximate magnitude of 45 kA, compared to typical magnitudes of 10 kA to 20 kA.

Protection detected the earth fault and operated correctly and as expected to clear the fault.

Aerial patrols have since been carried out on the 5A3 and 5A5 lines. This was completed during the last week of February 2020, and TransGrid advised that no obvious signs of damage on insulators or on the transmission lines were observed.

# 3. 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].

The power system was in a secure operating state throughout this incident. No action was required by AEMO to restore or maintain power system security.

## 3.1 Reclassification

AEMO assessed whether to reclassify this incident as a credible contingency event[6].

As TransGrid could not determine the cause(s) of the incident, AEMO determined that a simultaneous trip of the 5A3 and 5A5 lines was likely to reoccur and correctly reclassified the simultaneous loss of the 5A3 and 5A5 transmission lines as a credible contingency from 0700 hrs on 17 February 2020. This reclassification was cancelled at 2140 hrs on 17 February 2020 as there was no longer lightning activity in the vicinity of the lines.

AEMO now considers the 5A3 and the 5A5 lines as vulnerable transmission lines with a category of probable due to lightning.

# 4. 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[7] over the course of this incident.

[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] AEMO is required to assess whether or not to reclassify a non-credible contingency event as a credible contingency event – NER clause 4.2.3A(c) – and to report how the reclassification criteria were applied – NER clause 4.8.15(ca).

[7] AEMO generally informs the market about operating incidents as the progress by issuing Market Notices – see https://www.aemo.com.au/Market-Notices.

For this incident, AEMO informed the market on the following matters:

1. A non-credible contingency event – notify within two hours of the event[8].
   - AEMO issued Market Notice 74180 at 0543 hrs on 17 February 2020, 24 minutes after the event, to advise of the non-credible contingency event.
2. Reclassification, details, and cancellation of a non-credible contingency – notify as soon as practical[9].
   - AEMO issued Market Notice 74182 at 0701 hrs on 17 February 2020 to advise that AEMO was not satisfied that this non-credible event is unlikely to reoccur, and would therefore reclassify this event as a credible contingency event when lightning is in the vicinity.
   - AEMO issued Market Notice 74183 at 0701 hrs on 17 February 2020 to advise that AEMO now considered the 5A3 and the 5A5 lines as vulnerable transmission lines with a category of Probable due to lightning.
   - AEMO issued Market Notice 74184 at 0711 hrs on 17 February 2020 to advise that AEMO had reclassified the incident as a credible contingency.
   - AEMO issued Market Notice 74237 at 2141 hrs on 17 February 2020 to advise that the reclassification of the simultaneous trip of the 5A3 and the 5A5 lines had been cancelled, because a reoccurrence of the incident was no longer reasonably possible.

# 5. Conclusions

AEMO has assessed this incident in accordance with clause 4.8.15(b) 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.

AEMO has concluded that:

1. The trip of the 5A3 and the 5A5 lines was due to lightning, and all protections operated as designed and as expected to clear the fault.
2. AEMO correctly reclassified the simultaneous trip of the 5A3 and the 5A5 lines as a credible contingency after the incident.
3. AEMO now considers the 5A3 and the 5A5 lines to be vulnerable transmission lines with a category of Probable due to lightning.
4. The power system remained in a secure operating state throughout this incident.

[8] 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 7.3.

[9] AEMO is required to notify the market of a reclassification – NER clause 4.2.3(g), details of the reclassification – 4.2.3(c), and when AEMO cancels the reclassification – 4.2.3(h).

# A1. System diagram

The diagram below provides an overview of the 5A3 and 5A5 lines and where the faults occurred due to the single lightning strike shown by a red oval.

**Figure 1 An overview of the 5A3 and 5A5 lines**