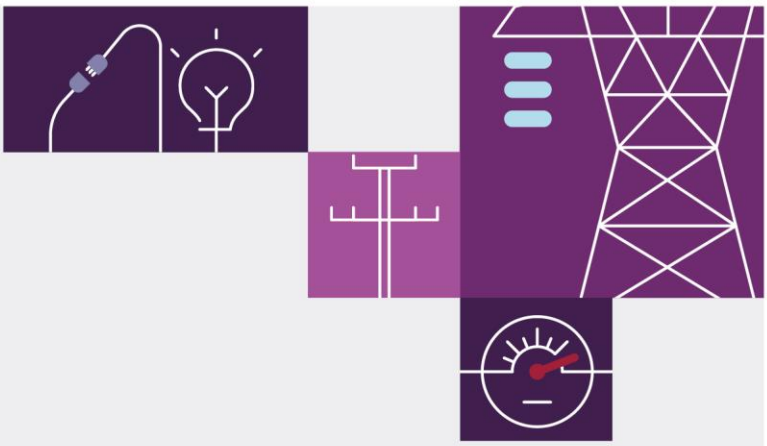
Trip of Sydney North 330/132 kV Transformer and 132 kV busbar

May 2022

Reviewable Operating Incident Report under the National Electricity Rules



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.

Disclaimer

AEMO has made every reasonable effort to ensure the quality of the information in this report but cannot guarantee its accuracy or completeness. Any views expressed in this report may be based on information given to AEMO by other persons.

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Contact

If you have any questions or comments in relation to this report, please contact AEMO at system.incident@aemo.com.au.

The NEM operates on Australian Eastern Standard Time (AEST). All times in this report are in AEST.

Abbreviations

Abbreviation	Term
AEMC	Australian Energy Market Commission
AEMO	Australian Energy Market Operator
AEST	Australian Eastern Standard Time
kV	Kilovolt
ms	Milliseconds
MW	Megawatts
NEM	National Electricity Market
NER	National Electricity Rules
TNSP	Transmission Network Service Provider

Incident review

This reviewable operating incident[1] report is prepared in accordance with clause 4.8.15(c) of the National Electricity Rules (NER). It has been prepared using information provided by Transgrid[2] and from AEMO systems.

Table 1 Summary of event

	Details
Reviewable operating incident type	Multiple contingency events impacting critical transmission elements.
Incident details	This report relates to a reviewable operating incident[3] that occurred on 10 February 2022 in New South Wales. The incident involved the trip of the Sydney North 330/132 kV No. 1 Transformer and the Sydney North 132 kV 1A busbar.
Incident classification	Transmission equipment failure – insulator string failure.
Generation impact	No generation was lost due to the incident.
Customer load impact	No load was lost due to the incident.
Incident key events	1. At 2111 hrs on 10 February 2022, the Sydney North 330/132 kV No. 1 Transformer and the 132 kV 1A busbar tripped (see Figure 1). 2. At 1941 hrs on 12 February 2022, the Sydney North 132 kV 1A busbar was returned to service. 3. At 2028 hrs on 12 February 2022, the Sydney North 330/132 kV No. 1 Transformer was returned to service.
Incident cause	Post-incident investigation by Transgrid has confirmed that at 2111 hrs on 10 February 2022, one insulator string on the overhead conductor between the Sydney North 132 kV 1A busbar and the Sydney North 330/132 kV No. 1 Transformer failed. The insulator string failure caused a phase to earth fault outside the busbar protection zone. The unrestrained differential protection tripped the Sydney North 330/132 kV No. 1 Transformer and cleared the fault in 59.4 ms. However, the conductor was left hanging on the underslung insulator and the disconnector on the Sydney North 330/132 kV No. 1 Transformer Bay. Approximately 10 seconds later, the hanging conductor caused a flashover to the Sydney North 132 kV 1A busbar. The busbar protection operated and cleared the fault in 58.6 ms. The protection systems which operated during this incident operated correctly and in line with expected performance.
Power system response (facilities and services)	There were no other material impacts on the broader power system, load, or generation.
Rectification	On 12 February 2022, Transgrid replaced all insulator strings on the Sydney North No. 1 Transformer Bay which were of the same type as the insulator string which failed. Transgrid has also confirmed that the other bays at Sydney North substation do not contain the same type of insulator which failed during this incident. Transgrid has initiated a review of substations likely to contain the same type of insulator which failed during this incident, and has put in place a separate inspection program to inspect the identified substations within the next 12 months. Based on the current low rate of failure rate, Transgrid considers the risk of future failures to be low.
Power system security	The power system remained in a secure operating state throughout this incident and the Frequency Operating Standard[4] was met.

[1] Reviewable operating incidents are defined by NER clause 4.8.15(a) and the AEMC Reliability Panel Guidelines for Identifying Reviewable Operating Incidents, found at https://www.aemc.gov.au/sites/default/files/2018-02/Final-revised-guidelines.pdf.

[2] Transgrid is a Transmission Network Service Provider (TNSP) for New South Wales.

[3] 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.

[4] See https://www.aemc.gov.au/sites/default/files/2020-01/Frequency%20operating%20standard%20-%20effective%201%20January%202020%20-%20TYPO%20corrected%2019DEC2019.PDF.

	Details
Reclassification	AEMO assessed whether to reclassify this incident as a credible contingency event[5]. The cause of the incident was identified by Transgrid and the Sydney North 330/132 kV No. 1 Transformer and the Sydney North 132 kV 1A busbar remained out of service until the faulty insulator strings were replaced, therefore AEMO correctly identified that reclassification was not required.
Market information	For this incident, AEMO issued the following market notices (all market notices for this incident were issued in accordance with NER requirements): • AEMO issued Market Notice 94571 at 2156 hrs on 10 February 2022 to advise of non-credible contingency event. • AEMO issued Market Notice 94603 at 2005 hrs on 12 February 2022 to advise the Sydney North 330/132 kV No. 1 Transformer and the Sydney North 132 kV 1A busbar returned to service.
Conclusions	AEMO has concluded that: 1. The trip of Sydney North 330/132 kV No. 1 Transformer and Sydney North 132 kV 1A busbar was caused by the failure of one insulator string on the overhead conductor between the Sydney North 132 kV 1A busbar and the Sydney North 330/132 kV No. 1 Transformer. This caused the protection system on the Transformer and the busbar to operate correctly and clear the faults. 2. AEMO correctly identified there was no requirement to reclassify this incident as a credible contingency. 3. The power system remained in a secure operating state throughout this incident and the Frequency Operating Standard was met. 4. Transgrid replaced all insulator strings at Sydney North 132 kV substation that have the same type as the failed insulator string on the Sydney North 132 kV 1A busbar bay. Transgrid has confirmed that the other Transformer bays at Sydney North do not contain this failed insulator string type and this incident is unlikely to re-occur. Transgrid has also initiated a separate inspection program to inspect, within the next 12 months, substations that are likely to contain the same type of insulator which failed during this incident.

[5] 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).

Figure 1 Post-incident diagram