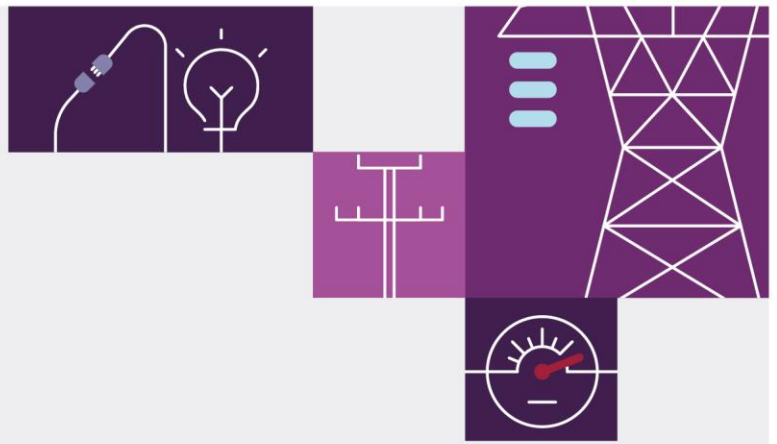


Trip of Belmont 275 kV No. 2 Busbar on 16 May 2023

September 2023

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

To inform its review and the findings expressed in this report, AEMO has been provided with data by registered participants as to the status or response of some facilities before, during and after the reviewable incident, and has also collated information from its own observations, records and systems. Any views expressed in this report are those of AEMO unless otherwise stated, and may be based on information given to AEMO by other persons. AEMO has made reasonable efforts 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
CB	circuit breaker
CT	current transformer
kV	kilovolt/s
MN	market notice
NEM	National Electricity Market
NER	National Electricity Rules
TNSP	Transmission Network Service Provider
VAr	volt-ampere/s reactive

Incident review

This reviewable operating incident¹ 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 Powerlink² and from AEMO systems.

Table 1 Summary of event

Details	
Reviewable operating incident type	Non-credible contingency event impacting critical transmission elements.
Incident details	This report relates to a reviewable operating incident ³ that occurred on 16 May 2023 in Queensland. The incident involved trip of Belmont 275 kilovolts (kV) No. 2 busbar.
Incident classification	Transmission equipment failure – current transformer (CT) insulation resistance failure.
Generation impact	No generation was lost as a result of this incident.
Customer load impact	No load was lost as a result of this incident.
Pre-incident conditions	Prior to the incident, capacitor banks 3, 4, 9 and 10 at Belmont 275 kV substation were not in service, all other equipment at Belmont 275 kV substation was in service (see Figure 1).
Incident key events	<p>On 16 May 2023, the following events occurred:</p> <ul style="list-style-type: none"> At 1852 hrs, circuit breaker (CB) 8302, CB 88372, CB 5442, CB 5042, and CB 5022 operated at Belmont 275 kV substation, tripping the Belmont 275 kV No. 2 busbar. Powerlink identified the root cause of the Belmont 275 kV No. 2 busbar trip as a secondary system issue with CB 8302. At 2142 hrs, the Belmont 275 kV No. 2 busbar was returned to service. CB 8302 remained out of service pending further investigation. <p>On 26 May 2023 at 1222 hrs, following replacement of a faulty CT on the C phase of CB 8302, the CB was returned to service.</p>
Incident cause	<p>Post incident investigation by Powerlink has confirmed that:</p> <ol style="list-style-type: none"> At 1852 hrs on 16 May 2023, the X busbar protection system of the Belmont 275 kV No. 2 busbar operated due to spill current (also known as differential current) supplied from the C phase CT associated with CB 8302. The C phase CT secondary core associated with CB 8302 had failed due to low insulation resistance. This resulted in spill current in the busbar unit protection of the Belmont 275 kV No. 2 busbar, causing the X busbar protection system to operate. The protection system operated in line with its settings and tripped the 275 kV CBs associated with the Belmont 275 kV No. 2 busbar.
Power system response (facilities and services)	There was no other material impact on the broader power system, load or generation.
Rectification	<p>On 16 May 2023, Powerlink identified the cause of Belmont busbar protection operation as a secondary system issue associated with CB 8302, after conducting a visual inspection of equipment at Belmont 275 kV substation and reviewing relevant relay records.</p> <p>On 26 May 2023, Powerlink informed AEMO that the faulty CT associated with CB 8302 had been replaced and returned CB 8302 to service.</p> <p>On 21 June 2023, Powerlink confirmed to AEMO that the trip of the Belmont 275 kV No. 2 busbar was due to low insulation resistance of the C phase CT secondary core associated with CB 8302.</p>

¹ Reviewable operating incidents are defined by NER 4.8.15(a) and the Australian Energy Market Commission (AEMC) Reliability Panel Guidelines for Identifying Reviewable Operating Incidents.

² Powerlink is the Transmission Network Service Provider (TNSP) for Queensland.

³ See NER 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.

Details	
Power system security	The power system remained in a secure operating state throughout this incident and the Frequency Operating Standard ⁴ was met for this incident.
Reclassification	AEMO assessed whether to reclassify this incident as a credible contingency event ⁵ . Powerlink advised AEMO that the root cause of the non-credible contingency event was a secondary issue associated with CB 8302 causing the Belmont 275 kV busbar No. 2 X busbar protection system to operate. Powerlink returned the Belmont 275 kV busbar No. 2 to service, but CB 8302 remained out of service pending further investigation. Under this scenario, AEMO was satisfied another occurrence of this event was unlikely to reoccur. Therefore, AEMO correctly did not classify the event as a credible contingency.
Market information	For this incident, AEMO issued the following market notices (all market notices for this incident were issued in accordance with NER requirements): <ul style="list-style-type: none"> • AEMO issued Market Notice (MN) 107943 at 1907 hrs on 16 May 2023 to advise the market of the non-credible contingency event involving the trip of Belmont 275 kV No. 2 busbar. • AEMO issued MN 107944 at 2211 hrs on 16 May 2023 to advise that the Belmont 275 kV No. 2 busbar had returned to service, the root cause of the incident had been identified and the event was unlikely to reoccur.
Conclusions	AEMO has concluded that: <ol style="list-style-type: none"> 1. On 16 May 2023, the Belmont 275 kV No. 2 busbar tripped due to the operation of its X busbar protection system. The busbar protection operated due to low insulation resistance on a C phase CT secondary core associated with CB 8302. This resulted in spill current in the unit protection of the Belmont 275 kV No. 2 busbar. This caused the busbar zone protection (unit protection) to operate, tripping the Belmont 275 kV No. 2 busbar. 2. The cause of this incident was identified by Powerlink and AEMO was satisfied that the event was unlikely to reoccur under the current circumstances. Therefore, AEMO correctly identified that reclassification was not required. 3. The power system remained in a secure operating state and the Frequency Operating Standard was met throughout this incident. 4. The root cause of the incident has been identified as a transmission equipment failure. 5. Powerlink replaced the CT associated with CB 8302 and restored the CB into service on 26 May 2023.
Recommendations	1. Nil.

⁴ Frequency Operating Standard, effective 1 January 2020, available at <https://www.aemc.gov.au/media/87484>.

⁵ AEMO is required to assess whether or not to reclassify a non-credible contingency event as a credible contingency event – NER 4.2.3A(c) – and to report how the reclassification criteria were applied – NER 4.8.15(ca).

Figure 1 Incident diagram – Belmont substation equipment status immediately following the incident

