AEMO
AUSTRALIAN ENERGY MARKET OPERATOR

Western Downs 275 kV No. 2 Busbar Trip on 22 March 2021

July 2021

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.

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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.

Abbreviations

Abbreviation	Term
AEMC	Australian Energy Market Commission
AEMO	Australian Energy Market Operator
AEST	Australian Eastern Standard Time
CB	Circuit breaker
ISO	Isolator
kV	Kilovolt
NEM	National Electricity Market
NER	National Electricity Rules
TNSP	Transmission network service provider
VT	Voltage transformer

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 Powerlink[2] and from AEMO systems.

Table 1 Summary of event - Western Downs 275 kV No. 2 Busbar trip

	Details
Reviewable operating incident type	Non-credible contingency event impacting critical transmission elements.
Incident details	This report relates to a reviewable operating incident that occurred on 22 March 2021 in Queensland. The incident was a non-credible contingency event involving the trip of Western Downs 275 kilovolt (kV) No. 2 Busbar (Western Downs No. 2 Busbar).
Incident classification	Other – induced circulating current in the current transformer following intermittent contact between isolated equipment and earthed high voltage conductor.
Generation impact	Nil
Customer load impact	Nil
Pre-incident conditions	Prior to the incident, the circuit breaker 89272 (CB89272) and CB5022 and their associated isolators were out of service due to planned maintenance works on the voltage transformer (VT) between isolator 89277 (ISO89277) and isolator 5028 (ISO5028). Other elements were in-service at the Western Downs substation.
Key events	1- At 1147 hrs on 22 March 2021, the Western Downs No. 2 Busbar protection operated, causing all of the in service closed circuit breakers on the No. 2 Busbar to trip. 2- The Western Down No. 2 Busbar was returned to service at 1301 hrs on 22 March 2021.
Incident cause	Induced circulating current in the current transformer (CT) of CB89272 resulted in No. 2 Busbar protection operation and subsequently the trip of Western Downs No. 2 Busbar.
Power system response (facilities and services)	As part of planned maintenance works, high voltage conductors had been removed from the VT side of ISO89277 and earthed. These removed conductors were tied back towards the CB89272 side of ISO89277. CB89272 and its associated CTs were out of service and isolated only on the primary side. Wind caused an intermittent contact to be formed between one of the removed high voltage conductors and the CB89272 side of ISO89277. As a result, a closed loop between the earth grid and the high voltage conductors was created. Due to CB89272's proximity to in-service high voltage equipment, an induced current flowed around this closed loop and through the CTs of CB89272. The induced current was sufficient to operate the No. 2 Busbar protection. The No. 2 Busbar protection operated as expected according to design and opened all in-service closed circuit breakers on the No. 2 Busbar. CB89272 remained closed because its trip circuits had been isolated as part of planned works, however ISO89277 was open as noted above. Refer to Figure 1 for the configuration at the Western Downs substation after the incident.

[1] Reviewable operating incidents are defined by NER clause 4.8.15(a) and the AEMC Reliability Panel Guidelines for Identifying Reviewable Operating Incidents.

[2] Powerlink is the transmission network service provider (TNSP) for Queensland.

	Details
	Powerlink advised that the CTs were not isolated from the secondary side, because the planned maintenance works did not involve any activity on CB89272 which could cause circulating current through its associated CTs. Powerlink's standard process requires isolation of the secondary side of the CTs only if the planned work involves any activities where circulating currents are considered possible.
Rectification and/or preventative procedure	Powerlink advised that additional precautions (including repositioning the tied back conductors) were implemented for the rest of this maintenance task to avoid the risk of creating an intermittent conductive path via the earth grid and the CTs of CB89272.
Power system security	The power system remained in a secure operating state throughout this incident
Reclassification	AEMO assessed whether to reclassify this incident as a credible contingency event[3]. Powerlink advised AEMO that the cause of the trip of the Western Downs No. 2 Busbar had been identified and the incident was unlikely to reoccur. Based on this advice, AEMO correctly determined the incident was unlikely to reoccur and therefore correctly determined that reclassification as a credible contingency event was not required.
Market information	For this incident, AEMO issued the following market notices[4] (all market notices for this incident were issued in accordance with NER requirements): • AEMO issued Market Notice 83524 at 1205 hrs on 22 March 2021. • AEMO issued Market Notice 83525 at 1304 hrs on 22 March 2021.
Conclusions	AEMO has concluded that: 1. The trip of Western Downs No. 2 Busbar was due to induced circulating current in the CT of the CB89272, following intermittent contact between the CB89272 side of ISO89277 and earthed high voltage conductor, which resulted in No. 2 Busbar protection operation. 2. The Western Downs No. 2 Busbar protection operated as expected and as designed. 3. Based on information provided by Powerlink at the time of the incident, AEMO was satisfied that the reason had been identified and a reoccurrence of this incident was unlikely, therefore the incident was not reclassified as a credible contingency. 4. The power system remained in a secure operating state throughout this incident.
Recommendations	AEMO will share details of this event with Transmission Network Service Providers at Power System Security Working Group and Operational Planning Working Group meetings in Q3 2021 to enable them to consider any implications for maintenance practices.

[3] 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).

[4] See https://aemo.com.au/en/market-notices.

Figure 1 The configuration at the Western Downs substation after the incident including the intermittent conductive path through the current transformers of CB89272