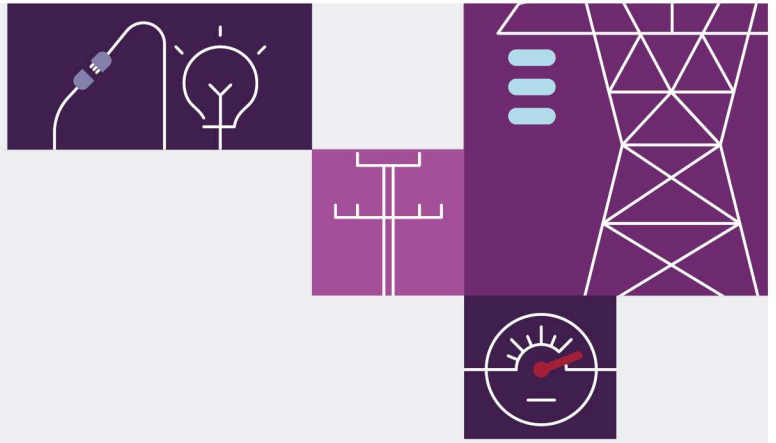


# Trip of Bulli Creek – Braemar and Bulli Creek – Dumaresq 330 kV Lines on 5 November 2022

May 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](mailto: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
CBF	Circuit Breaker Fail
kV	Kilovolt
MW	Megawatts
NEM	National Electricity Market
NER	National Electricity Rules
SVC	Static Var Compensator
TNSP	Transmission Network Service Provider

# Incident review

This reviewable operating incident<sup>1</sup> 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<sup>2</sup> and from AEMO systems.

**Table 1 Summary of event**

Details	
<b>Reviewable operating incident type</b>	Multiple contingency events impacting critical transmission elements that occurred within 30 minutes of each other.
<b>Incident details</b>	This report relates to a reviewable operating incident <sup>3</sup> that occurred on 5 November 2022 in Queensland. This incident involved the trip of the Bulli Creek – Braemar 330 kilovolt (kV) line (9902 Line), shortly followed by the trip of the Bulli Creek – Dumaresq 330 kV line (8M Line).
<b>Incident classification</b>	Protection/control system maloperation – intermittent fault with a current transformer sensor.
<b>Generation impact</b>	No generation was lost as a result of this event.
<b>Customer load impact</b>	No customer load was tripped or automatically shed in response to this incident.
<b>Pre-incident conditions</b>	Prior to the event, all 330 kV lines between Bulli Creek, Braemar and Dumaresq were in service (see Figure 1).
<b>Incident key events</b>	On 5 November 2022, the following events occurred: <ul style="list-style-type: none"> <li>At 0651 hrs on the 9902 Line tripped, auto reclosed and tripped to lockout<sup>4</sup>.</li> <li>At 0659 hrs the 8M Line tripped. There was no auto reclose operation associated with the 8M Line.</li> <li>At 0921 hrs the 8M Line was returned to service.</li> <li>At 1511 hrs the 9902 Line X protection was isolated.</li> <li>At 1528 hrs the 9902 Line was returned to service.</li> </ul>
<b>Incident cause</b>	Post incident investigation by Powerlink has confirmed: <ul style="list-style-type: none"> <li>At 0651 hrs on 5 November 2022, the X differential protection of the 9902 Line unexpectedly operated due to an incorrect output from a faulty current transformer sensor on the 330 kV circuit breaker (CB6032) at Bulli Creek. This X differential protection operation tripped the 9902 Line (see Figure 2).</li> <li>At 0659 hrs, the CB6032 Circuit Breaker Fail (CBF) protection system unexpectedly operated to trip the 330 kV circuit breaker 8M2 at Bulli Creek and initiated an inter-trip to the Dumaresq 330 kV substation. Once triggered, the CBF protection operated as designed to trip 330 kV circuit breakers 8M2 and 5012 and disconnect the 8M Line (see Figure 3).</li> <li>The X differential protection and the CBF protection for CB6032 use the output from same faulty CB3602 current transformer sensor. Powerlink's investigation concluded that the faulty current transformer sensor output continued for a duration of time sufficient to cause the CBF protection of CB6032 to operate despite no primary current flow through the open circuit breaker.</li> </ul>
<b>Power system response (facilities and services)</b>	There was no other material impact on the broader power system, load or generation.
<b>Rectification</b>	On 9 December 2022, Powerlink confirmed to AEMO that the trip of both lines was due to an intermittent fault with a current transformer sensor at Bulli Creek 330 kV substation. Powerlink informed AEMO that on 6 November 2022 the faulty sensor had been replaced and the 9902 Line X protection was returned to service.

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

<sup>2</sup> Powerlink is a Transmission Network Service Provider (TNSP) for Queensland.

<sup>3</sup> 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.

<sup>4</sup> The auto reclose function reenergises the line after the initial fault and will trip and remain out of service (or locked out) for a persistent fault.

Details	
<b>Power system security</b>	The power system remained in a secure operating state throughout this incident and the Frequency Operating Standard <sup>5</sup> was met for this incident.
<b>Reclassification</b>	<p>AEMO assessed whether to reclassify this incident as a credible contingency event<sup>6</sup>.</p> <p>Powerlink considered the risk of the current sensor fault causing mal-operation of the 9902 Line X protection system low. This was because the output of the current transformer sensor had returned to a normal state at 0700 hrs and its performance monitored with no issues identified. As an additional risk mitigation, Powerlink isolated the 9902 Line X protection before returning 9902 Line to service.</p> <p>An 8M Line trip due to current sensor fault required both the 9902 Line X protection to operate and the protection to remain active for an extended period, to cause CB6032 CBF protection to operate. For these reasons Powerlink considered the risk of an 8M Line trip very low and returned the 8M Line to service.</p> <p>Given the above mitigation and that the incident was unlikely to re-occur, AEMO correctly identified that reclassification was not required.</p>
<b>Market information</b>	<p>For this incident, AEMO issued the following market notices (all market notices for this incident were issued in accordance with NER requirements):</p> <ul style="list-style-type: none"> <li>• AEMO issued Market Notice 102893 at 0722 hrs on 5 November 2022 – Advice of the inter-regional transfer limit variation and the trip of 9902 Line.</li> <li>• AEMO issued Market Notice 102896 at 0721 hrs on 5 November 2022 – Advice of the inter-regional transfer limit variation and the trip of the 8M Line.</li> <li>• AEMO issued Market Notice 102914 at 1542 hrs on 5 November 2022 – Advice of cancellation of the inter-regional transfer limit variation and the return to service of the 9902 Line.</li> <li>• AEMO issued Market Notice 102906 for 8M Line at 1558 hrs on 5 November 2022 – Advice of cancellation of the inter-regional transfer limit variation and the return to service of the 8M Line.</li> </ul>
<b>Conclusions</b>	<p>AEMO has concluded that:</p> <ol style="list-style-type: none"> <li>1. On 5 November 2022, the 9902 Bulli Creek - Braemar 330 kV line (9902 Line) tripped due to the unexpected operation of its X differential protection. This protection operated due to a faulty current transformer sensor on the 330 kV circuit breaker CB6032 at Bulli Creek 330 kV substation. The faulty current transformer sensor then caused the CB6032 CBF protection to unexpectedly operate, causing the Bulli Creek - Dumaresq 330 kV line (8M Line) to trip.</li> <li>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.</li> <li>3. The power system remained in a secure operating state and the Frequency Operating Standard was met throughout this incident.</li> <li>4. The root cause of the incident has been identified as a protection and control system maloperation. Powerlink replaced the current transformer sensor and restored the X protection into service on the 6 November 2022.</li> </ol>
<b>Recommendations</b>	Powerlink to share findings of the investigation of the current sensor mal-operation via the Power System Security Working Group (PSSWG) by Q2 2023.

<sup>5</sup> Frequency Operating Standard, effective 1 January 2020, available at <https://www.aemc.gov.au/media/87484>.

<sup>6</sup> 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 Pre-incident diagram (Bulli Creek)

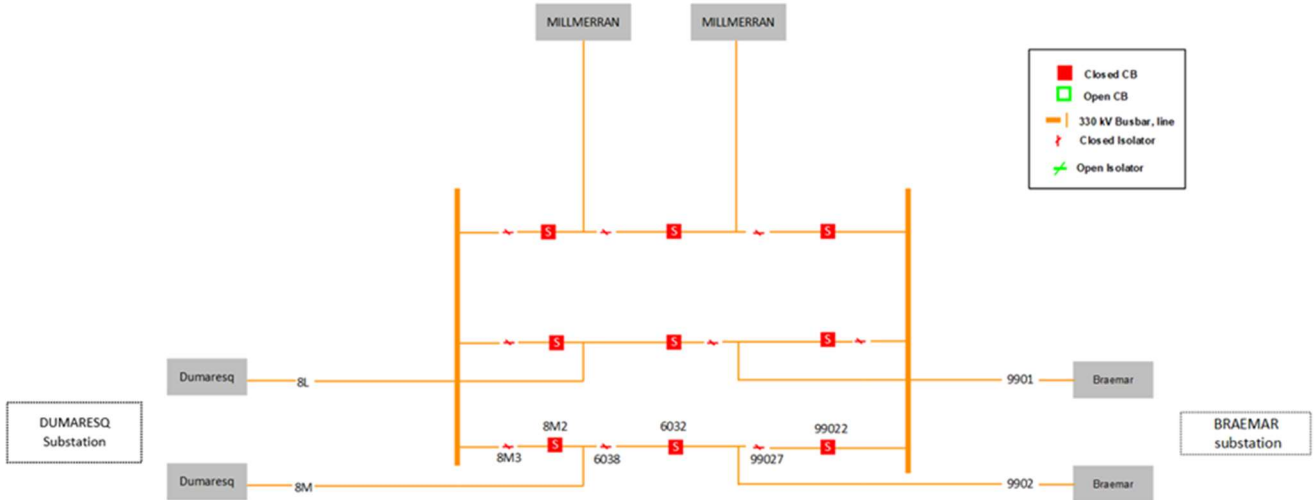


Figure 2 Post-incident diagram (Bulli Creek) Trip of 9902 Line

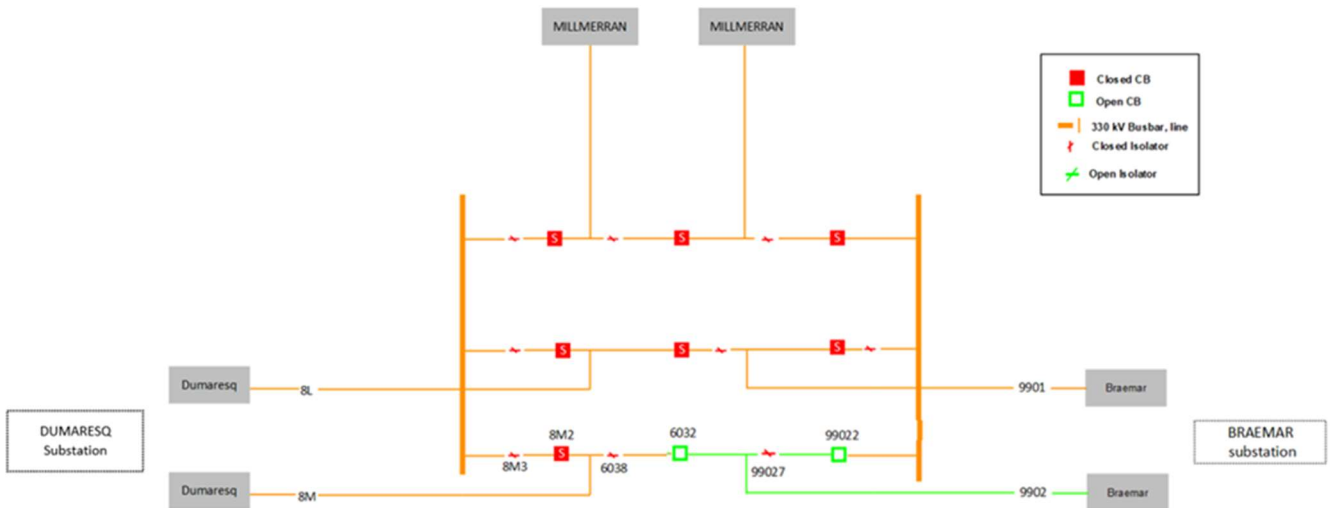


Figure 3 Post incident diagram (Bulli Creek) Trip of 8M Line

