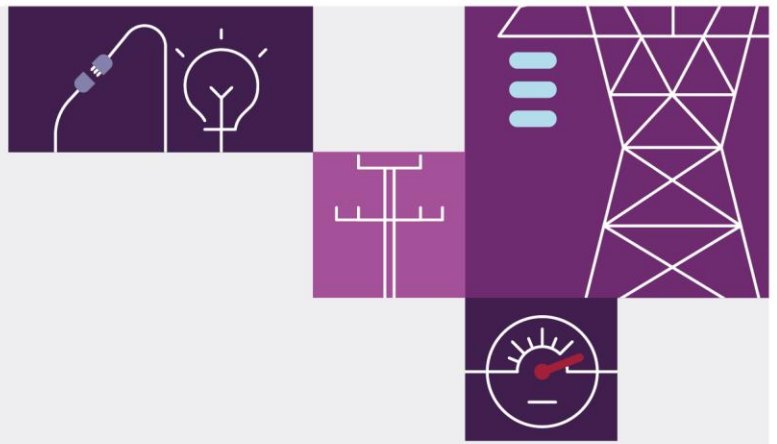


# Trip of the George Town – Hadspen 220 kV No. 2 line at George Town end only on 17 February 2022

July 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

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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
GT	George Town
HS	Hadspen
kV	kilovolt/s
MW	Megawatt/s
ms	mili Second/s
NEM	National Electricity Market
NER	National Electricity Rules
p.u.	Per Unit
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 TasNetworks<sup>2</sup> and from AEMO systems.

**Table 1 Summary of event**

Details	
<b>Reviewable operating incident type</b>	<ul style="list-style-type: none"> <li>Non-credible contingency event impacting critical transmission element.</li> </ul>
<b>Incident details</b>	<p>This report relates to a reviewable operating incident<sup>3</sup> that occurred on 17 February 2022 in Tasmania. The incident involved the trip of the George Town (GT) — Hadspen (HS) 220 kilovolt (kV) No. 2 line at the GT end only.</p>
<b>Incident classification</b>	<ul style="list-style-type: none"> <li>Protection/control system maloperation – maloperation of the stub bus protection scheme.</li> </ul>
<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>Incident key events</b>	<ol style="list-style-type: none"> <li>At 1829 hrs on 17 February 2022, the GT — HS 220 kV No. 2 transmission line tripped at the GT end only.</li> <li>At 1831 hrs on 17 February 2022, the GT — HS 220 kV No. 2 line was manually put on load.</li> </ol>
<b>Incident cause</b>	<p>Post incident investigation by TasNetworks has confirmed:</p> <ul style="list-style-type: none"> <li>At 1829 hrs on 17 February 2022, the stub bus protection scheme implemented in relay D199B maloperated to disconnect the GT — HS 220 kV No. 2 transmission line. TasNetworks confirmed that there was no fault on the network.</li> <li>The stub bus protection element of the protection is only armed when disconnecter D129C is open (see Figure 1). When armed, the stub bus protection operates as an instantaneous over-current protection.</li> <li>At the time of the trip, the D199B relay spuriously registered the D129C disconnecter as being open for 3 milliseconds (ms) and hence initiated tripping of circuit breakers D152 and D752 as designed even though the disconnecter D129C was physically closed (see Figure 2). The spurious registration of D129C disconnecter being open was most likely caused by an incorrect internal state within the relay.</li> <li>TasNetworks has identified secondary causes of the incident as:               <ul style="list-style-type: none"> <li>The use of single input disconnecter statuses for the stub bus protection design, and</li> <li>The D199B relay's contact input debounce setting being set too low to inhibit a transient logic change in the relay.</li> </ul> </li> </ul>
<b>Power system response (facilities and services)</b>	There were no other material impacts on the broader power system, load, or generation.
<b>Rectification</b>	<p>To address the issue identified through this event, TasNetworks has increased the relay disconnecter position input binary contact debounce time from 2 ms to 16 ms and increased the stub bus protection pickup current setting from 0.2 per unit (p.u.) (240 amps [A]) to 1 p.u. (1,200 A) on relay D199B. Further, in future designs, dual input status of line disconnecter will be used to arm the scheme to enhance the security of stub bus protection scheme. In dual input configuration, both the normally open contact and normally closed contact are used to determine the state of the primary plant.</p> <p>To address similar issues associated with other relays, TasNetworks has also undertaken the following remedial actions:</p>

<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> TasNetworks is a Transmission Network Service Provider (TNSP) for Tasmania.

<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.

Details	
	<ul style="list-style-type: none"> <li>Revised settings and logic of the stub bus protection scheme have been bench tested and implemented on C199B, A199B, and B199B relays at GT substation protecting the GT — HS 220 kV No. 1, Sheffield — GT 220 kV No. 1, and Sheffield — GT 220 kV No. 2 transmission lines, respectively.</li> <li>Revised debounce time settings have been implemented on the relevant relays at Waddamana substation for the stub bus protection scheme.</li> </ul>
<b>Power system security</b>	The power system remained in a secure operating state throughout this incident, and the Frequency Operating Standard <sup>4</sup> was met for this incident.
<b>Reclassification</b>	<p>AEMO assessed whether to reclassify this incident as a credible contingency event<sup>5</sup>.</p> <p>The cause of this non-credible contingency was not known to AEMO at the time of the event. As such, AEMO considered the GT — HS 220 kV No. 2 line trip at GT end was reasonably possible to reoccur and correctly reclassified the event as a credible contingency.</p> <p>On 14 April 2022, TasNetworks advised AEMO that the required settings changes had been applied and confirmed that the event was no longer reasonably possible. AEMO then responded and correctly cancelled the reclassification of this event as a credible contingency.</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>Market Notice 94678 at 1853 hrs on 17 February 2022 – Advice of non-credible contingency event and reclassification of event as a credible contingency.</li> <li>Market Notice 94679 at 1854 hrs on 17 February 2022 – Update to advice of non-credible contingency event and reclassification of event as a credible contingency.</li> <li>Market Notice 95861 at 1730 hrs on 14 April 2022 – Cancellation of reclassification of a non-credible contingency event as a credible contingency event.</li> </ul>
<b>Conclusions</b>	<p>AEMO has concluded that:</p> <ol style="list-style-type: none"> <li>The stub bus protection scheme implemented on relay D199B maloperated to disconnect the GT — HS 220 kV No. 2 transmission line at the GT end only.</li> <li>AEMO correctly identified the need to reclassify this incident as a credible contingency until the cause of the incident had been identified and rectified.</li> <li>The D199B relay spuriously registered the D129C disconnecter as being open for 3 ms and hence, initiated tripping of circuit breakers D152 and D752 as designed even though the disconnecter D129C was physically closed.</li> <li>TasNetworks has completed the implementation of the revised settings and logic in relay D199B on GT — HS 220 kV No. 2 line. Further, the settings and logic in C199B, A199B, and B199B relays at GT substation that protect GT — HS 220 kV No. 1 line, Sheffield — GT 220 kV No. 1, and Sheffield — GT 220 kV No. 2 transmission lines have been revised. The revised debounce time settings of the relevant relays in the Waddamana substation are also updated.</li> </ol>
<b>Recommendations</b>	<ol style="list-style-type: none"> <li>TasNetworks to share the cause of this incident with the Power System Security Working Group.</li> <li>TasNetworks to modify the Protection of Transmission Line Standard to include mandatory requirement of using double point status of line disconnecter for stub bus protection.</li> <li>AEMO recommends TasNetworks consider increasing existing contact debounce time setting of relays to a suitable value during corrective or upgrade works.</li> </ol>

<sup>4</sup> Frequency Operating Standard, effective 1 January 2020, [2020-frequency-operating-standard.pdf](#).

<sup>5</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 Incident diagram – system prior to the trip of D152 and D752 circuit breakers (CBs)

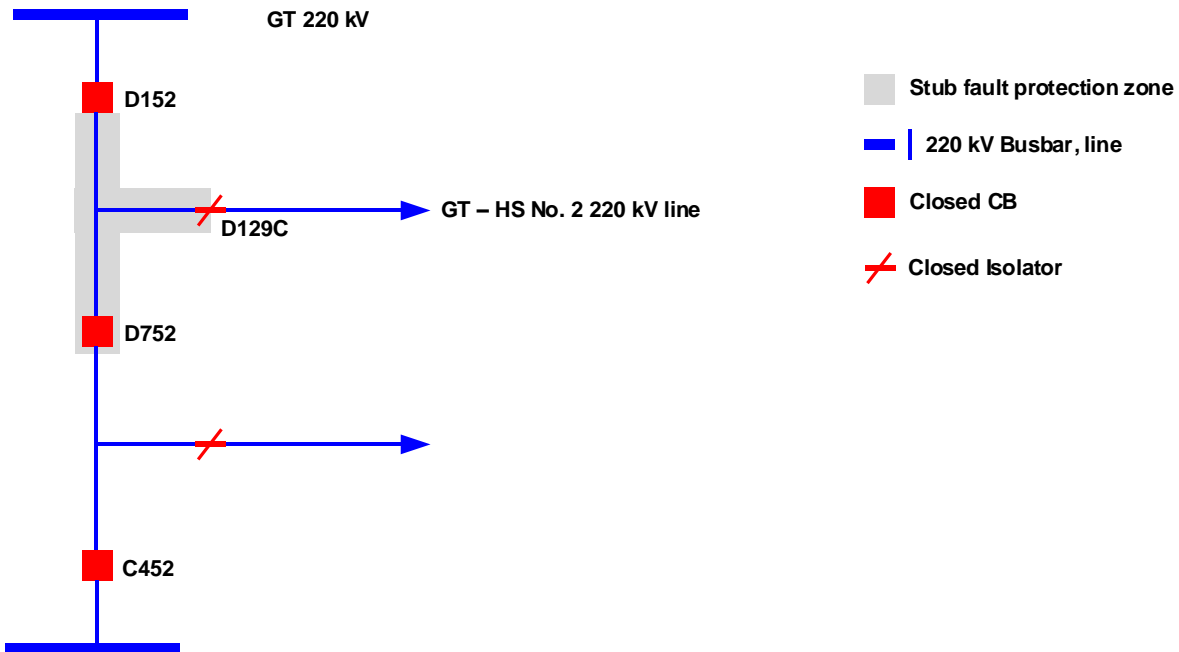


Figure 2 Incident diagram – system following the trip of D152 and D752 CBs

