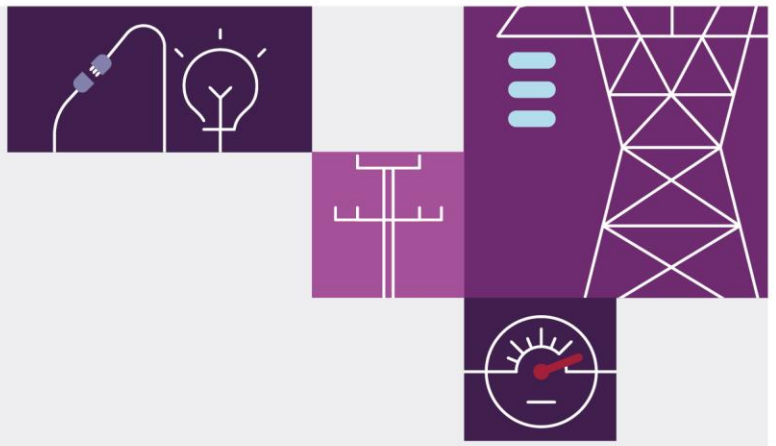


# Trip of Eildon Power Station No. 2 220 kV Bus on 27 January 2022

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.

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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
CBM	Circuit Breaker Management
EPS	Eildon Power Station
FOS	Frequency Operating Standard
kV	Kilovolt
MW	Megawatts
NEM	National Electricity Market
NER	National Electricity Rules
PSSWG	Power System Security Working Group
SCADA	Supervisory Control and Data Acquisition
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 AusNet<sup>2</sup> and from AEMO systems.

**Table 1 Summary of event**

Details	
<b>Reviewable operating incident type</b>	Non-credible contingency event impacting critical transmission elements.
<b>Incident details</b>	This report relates to a reviewable operating incident <sup>3</sup> that occurred on 27 January 2022 in Victoria. The incident involved the trip of the Eildon Power Station (EPS) No. 2 220 kV busbar.
<b>Incident classification</b>	Other – Generator circuit breaker (CB) failed to open when issued open command and subsequent protection trip signal.
<b>Generation impact</b>	Nil
<b>Customer load impact</b>	Nil
<b>Pre-incident conditions</b>	Controllers at Eildon Power Station were in the process of taking the EPS No.1 Generator offline and issued an open command to the No.1 Generator CB. 0 illustrates the network configuration immediately prior to the event.
<b>Incident key events</b>	At 2044 hrs on 27 January 2021, the EPS No. 2 220 kV busbar tripped, off-loading the Mount Beauty – Eildon No. 1 220 kV line (See Figure 2). Approximately two hours later, at 2245 hrs, the EPS No. 2 220 kV busbar was returned to service following isolation of the No.1 Generator 220 kV CB.
<b>Incident cause</b>	<p>Based on post-investigation by AusNet, on 27 January 2022 controllers at Eildon Power Station were in the process of taking the EPS No. 1 Generator offline and issued an open command to the EPS No. 1 Generator CB. The CB failed to open, but the shutdown sequence of the generator had already started. While there was no MW output from EPS No. 1 generator, but the 220 kV CB remained connected to the power system, the generator started motoring. This motoring condition was detected by EPS No. 1 Generator reverse power flow protection, which then operated and sent trip signals to the EPS No. 1 Generator CB. On receipt of the reverse power protection trip signals, the generator CB failed to open again. The circuit breaker fail protection at EPS then operated and opened all CBs on the No. 2 220 kV bus.</p> <p>Post-incident investigation by AusNet has confirmed:</p> <ul style="list-style-type: none"> <li>• The No. 1 Generator CB failed to open during this incident due to the presence of oily residue on the CB trip latch which had collected dust and caused the CB latch to fail to release.</li> <li>• As the No. 1 Generator was shutting down and the generator CB remained closed, the generator started to motor, which caused the reverse power protection at the power station to operate and send X and Y inter-trip signals to trip the No. 1 Generator 220 kV CB. On receipt of the trip signals, the EPS No. 1 Generator CB's latch again failed to release. As this CB had now failed to open after receiving a protection inter-trip signal, the CB fail protection then operated to open all other CBs connected to the EPS No. 2 220 kV busbar. Due to successful CB fail operation, the motoring condition only persisted for approximately 28 seconds.</li> </ul> <p>This EPS No. 1 Generator CB was last maintained in 2020 and was operating well within its maintenance cycle. The series of events leading to transfer of oily residue onto the trip latch cannot be fully resolved, but the trip latch is located within close proximity to high speed, fully lubricated components. Thus, it is in a region where it would be exposed to lubricant spray during normal operation and/or prone to receive evaporative residue from lubrication on neighbouring components.</p>
<b>Power system response (facilities and services)</b>	There were no other material impacts on the broader power system, load, or generation. See Attachment B for power flows to EPS and voltage at EPS and MBTS.

<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> Participant is a Transmission Network Service Provider (TNSP) for Eildon Power Station.

<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	
<b>Rectification</b>	<p>AusNet identified the root cause of the incident and has advised AEMO of the following corrective action to prevent the future re-occurrence of the incident:</p> <ul style="list-style-type: none"> <li>• The area around the latch mechanism in the CB was cleaned and re-lubricated.</li> <li>• The latch mechanism was replaced with a new spare component as a precautionary measure.</li> </ul>
<b>Power system security</b>	<p>The power system remained in a secure operating state throughout this incident and the Frequency Operating Standard (FOS)<sup>4</sup> was met for this incident.</p>
<b>Reclassification</b>	<p>AEMO assessed whether to reclassify this incident as a credible contingency event<sup>5</sup>. The cause of this incident was identified and rectified by AusNet prior to the return to service of the generator CB and EPS No. 2 220 kV busbar, therefore 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 94123 at 2102 hrs on 27 January 2022 – Advise of non-credible contingency event. The cause of this non-credible contingency was not known at this stage.</li> <li>• AEMO issued Market Notice 94125 at 2253 hrs on 27 January 2022 – Update on the advice of non-credible contingency event. The cause of this non-credible contingency event had been identified and AEMO was satisfied that another occurrence of this event was unlikely under the current circumstances.</li> </ul>
<b>Conclusions</b>	<p>AEMO has concluded that:</p> <ol style="list-style-type: none"> <li>1. The trip latch in the No. 1 Generator CB failed to open after being issued an open command. AusNet has confirmed that the CB failed to open as the CB’s trip latch was found to have an oily residue that had collected dust.</li> <li>2. The EPS No. 1 Generator was being taken offline when the EPS No. 1 Generator CB failed to open. The EPS No. 1 Generator started motoring as it remained connected to the power system. This motoring condition was detected by the generator’s reverse power flow protection which sent inter-trip signals to the EPS No.1 Generator CB but the CB again failed to open. The CB fail protection then operated opening all other CBs connected to No. 2 220 kV bus.</li> <li>3. The area around the latch mechanism in the CB was cleaned and re-lubricated. The latch mechanism was replaced. The CB was returned to service along with the EPS No. 2 220 kV busbar on 27 Jan 2022.</li> <li>4. The power system remained in a secure operating state throughout this incident and the FOS was met for this incident.</li> </ol>
<b>Recommendations</b>	<ol style="list-style-type: none"> <li>1. AusNet to review the maintenance procedures for this model of circuit breaker within its network.</li> <li>2. AusNet to share the findings of this incident at the Power System Security Working Group (PSSWG).</li> <li>3. AEMO recommend NSPs to share details of any future issues associated with dust ingress on CB trip latches via the PSSWG.</li> </ol>

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

<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).



## Attachment A – System diagram

The diagram below provides an overview of part of the power system immediately after the incident.

**Figure 1 Pre-incident diagram**

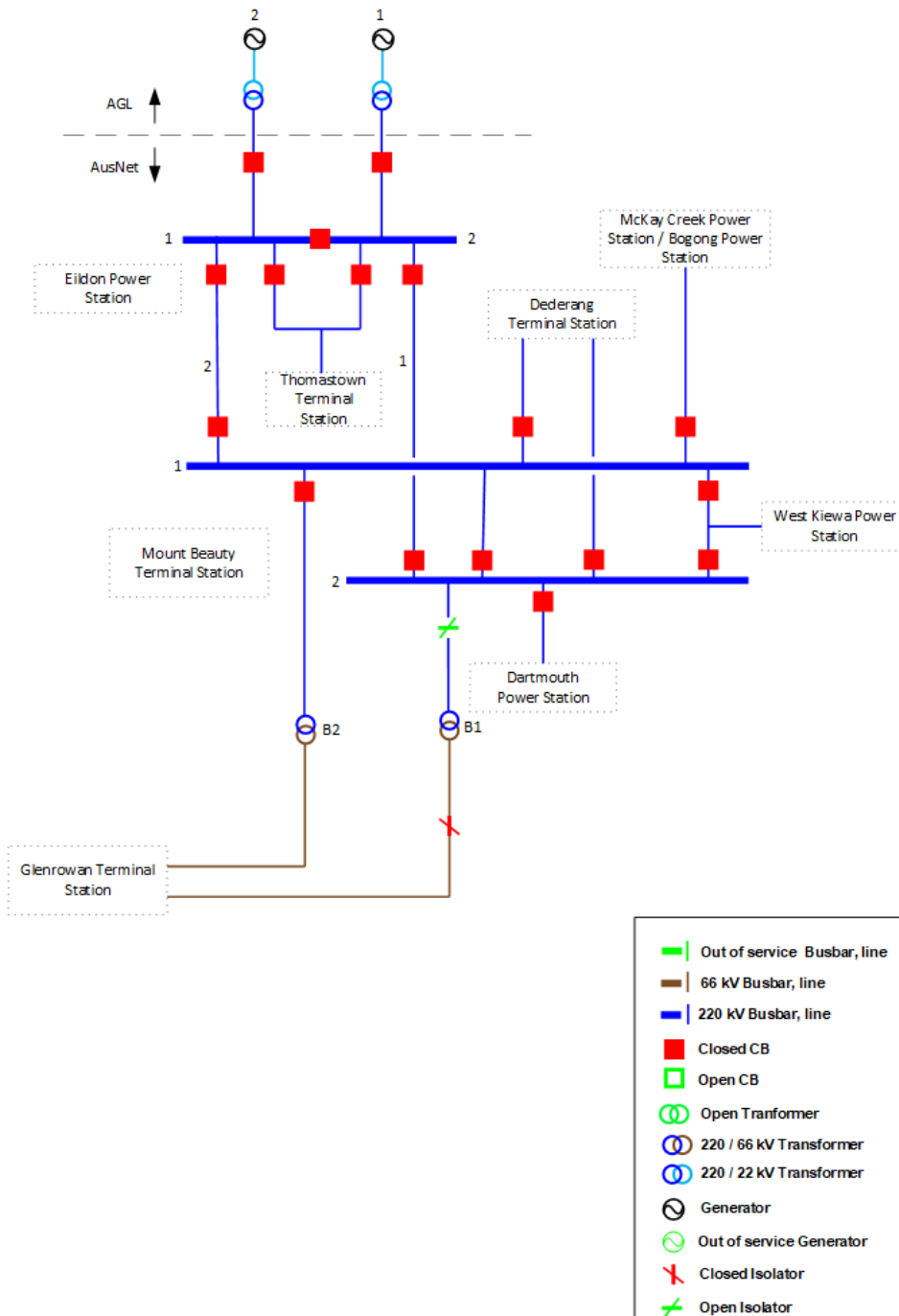
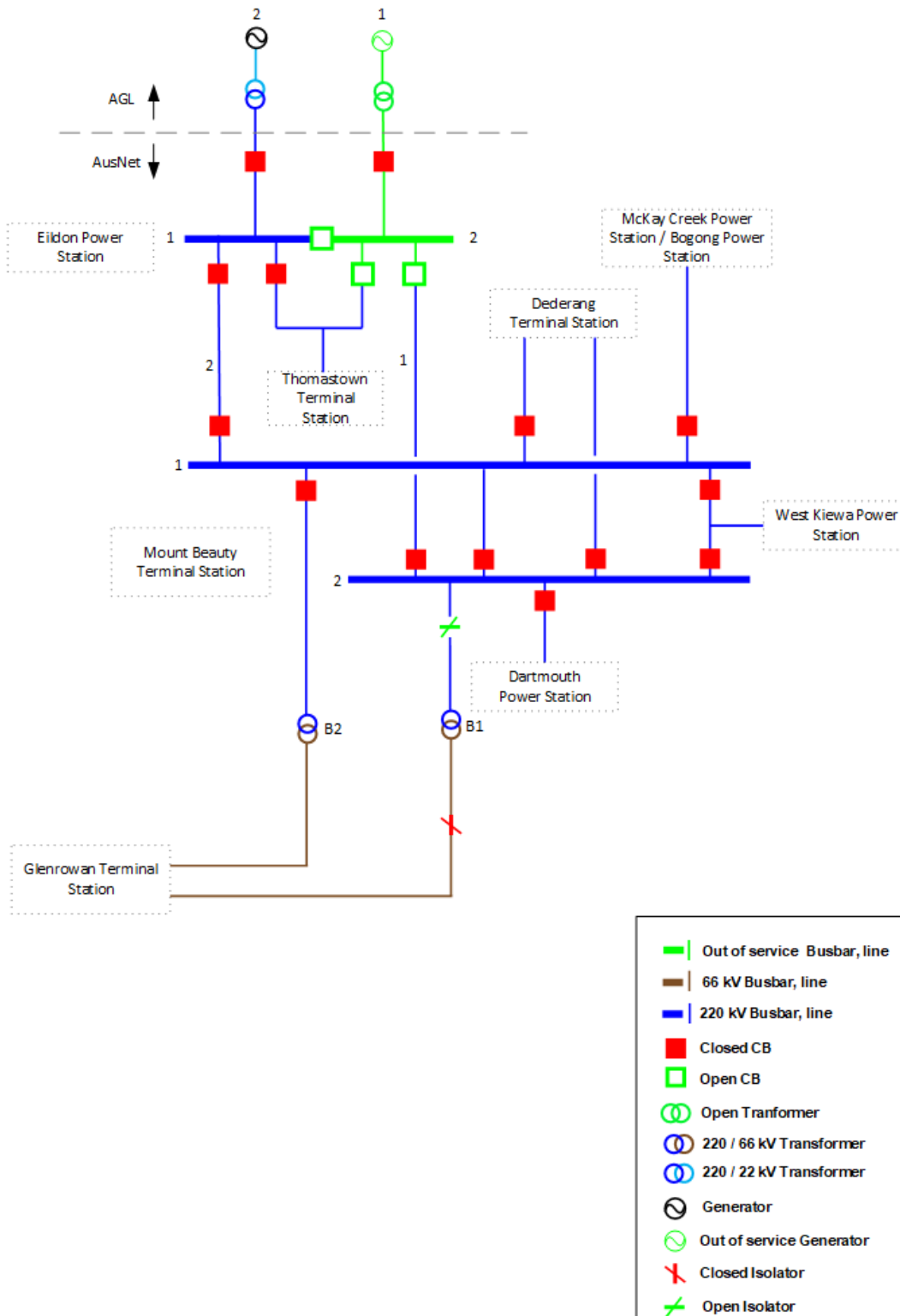




Figure 2 Post-incident diagram





Attachment B – SCADA measurements at EPS and MBTS

Figure 3 EPS generator unit 1 output (4s SCADA data)

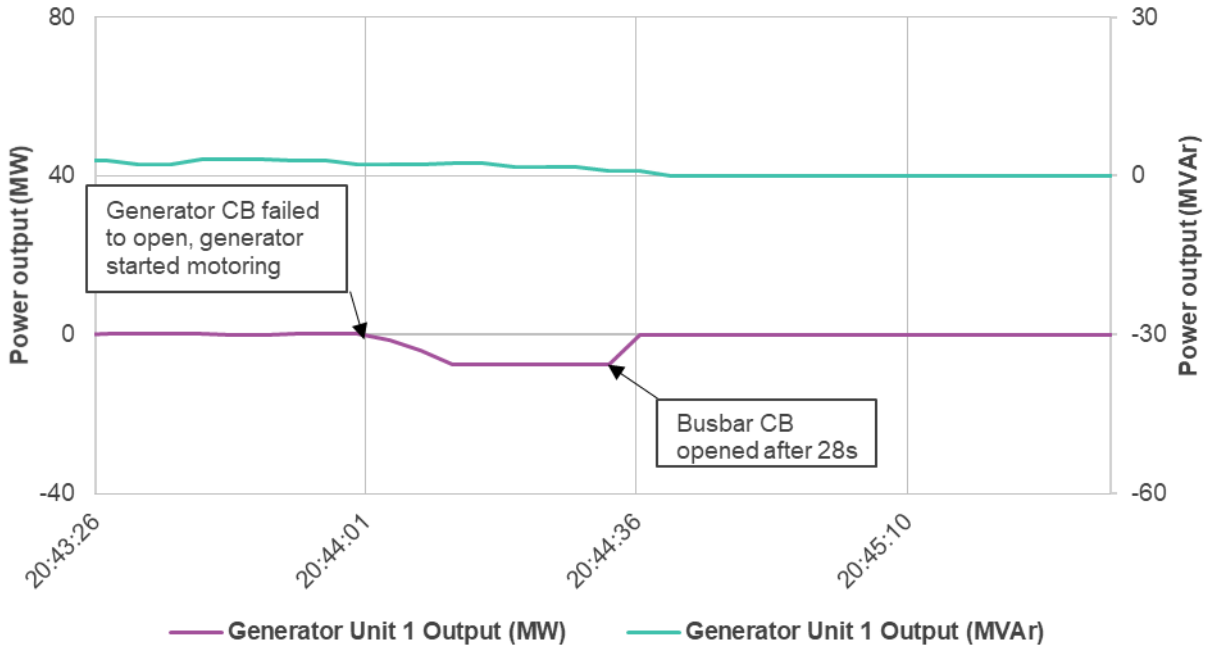


Figure 4 EPS 220 kV No.2 bus voltage (4s SCADA data)

