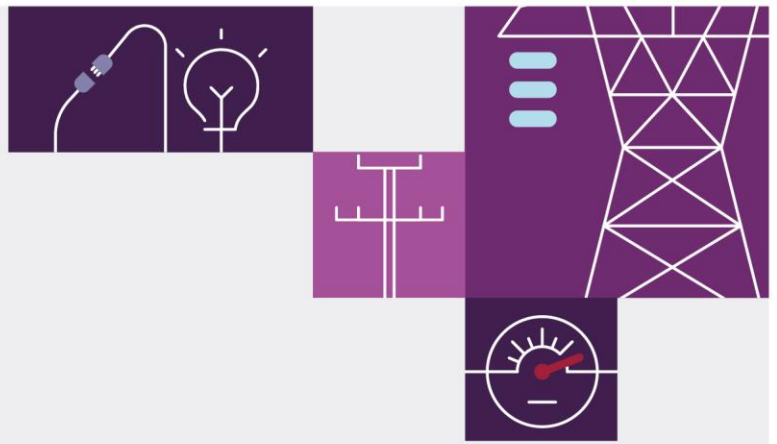


Trip of Broken Hill – Silverton X6 220 kV line, Silverton Wind Farm and Broken Hill Solar Farm on 28 September 2021

January 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

AEMO has made every reasonable effort 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.

Accordingly, to the maximum extent permitted by law, AEMO and its officers, employees and consultants involved in the preparation of this document:

- make no representation or warranty, express or implied, as to the currency, accuracy, reliability or completeness of the information in this document; and
- are not liable (whether by reason of negligence or otherwise) for any statements or representations in this document, or any omissions from it, or for any use or reliance on the information in it.]

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
kV	Kilovolt
MW	Megawatts
NEM	National Electricity Market
NER	National Electricity Rules
TNSP	Transmission Network Service Provider
TTS	Transfer Tripping Scheme

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 Transgrid² and from AEMO systems.

Table 1 Summary of event – Trip of Broken Hill - Silverton X6 220 kV line and Silverton Wind Farm and Broken Hill Solar Farm

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 28 September 2021 in New South Wales. The incident was a non-credible contingency event involving the trip of the Broken Hill – Silverton X6 220 kV line, the Silverton 220 kV/33 kV transformer and the Broken Hill Solar Farm. The trip of the Silverton 220 kV/33 kV transformer also disconnected Silverton Wind Farm from the system.
Incident classification	Protection/control system – maloperation of Silverton Wind Farm Transfer Tripping Scheme (TTS).
Generation impact	170 MW of generation was disconnected 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 event, there was significant storm activity over the Buronga – Broken Hill X2 220 kV line.
Incident key events	<ol style="list-style-type: none"> At 2233 hrs on 28 September 2021, coinciding with the daily self-check of the TTS⁴: <ul style="list-style-type: none"> The Broken Hill – Silverton X6 220 kV line tripped, The Silverton 220 kV/33 kV transformer tripped and disconnected the Silverton Wind Farm, and The Broken Hill Solar Farm tripped (see Figure 1 for the post-event configuration). Transgrid identified the cause of the trip as the maloperation of the Silverton Wind Farm TTS which monitors the Broken Hill – Buronga X2 220 kV line⁵ and at 0852 hrs on 29 September 2021: <ul style="list-style-type: none"> The Broken Hill – Silverton X6 220 kV line was returned to service with the Silverton Wind Farm TTS isolated, and The Silverton 220 kV/33 kV transformer returned to service. At 0947 hrs on 29 September 2021, the Silverton Wind Farm TTS was investigated by Transgrid and proven to be fully operational. The Silverton Wind Farm TTS was returned to service.
Incident cause	Post-incident investigation by Transgrid confirmed that the Silverton Wind Farm TTS received a signal at Broken Hill indicating the Buronga end of the Broken Hill – Buronga X2 220 kV line had tripped. Based on this signal, the Silverton Wind Farm TTS operated, tripping the Broken Hill – Silverton X6 220 kV line, the Silverton 220 kV/33 kV transformer and the Broken Hill Solar Farm. In line with the design of the scheme, the trip of the Silverton 220 kV/33 kV transformer also disconnected Silverton Wind Farm from the system. Further investigation has shown that no signal appears to have been sent from Buronga to Broken Hill to initiate the trip, confirming that the Silverton Wind Farm TTS scheme had mal-operated.

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 Transgrid is a Transmission Network Service Provider (TNSP) for New South Wales.

³ 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.

⁴ The daily self-check occurs at approximately 2230 hrs each day.

⁵ The Silverton Wind Farm TTS is a special protection scheme which is owned/operated by Transgrid. The scheme is installed to ensure Broken Hill substation security in case of an islanding situation of Silverton Wind Farm/Broken Hill Solar Farm, after line 63, OX1, X2, X3, X5 or any Darlington Point 330/220 kV transformer has tripped.

Details	
	Transgrid believes that, as there was significant storm activity over the Broken Hill – Buronga X2 220 kV line, the reflected signal from the TTS’s daily self-check may have been corrupted, resulting in the incorrect operation of the Silverton Wind Farm TTS.
Power system response (facilities and services)	There were no other material impacts on the broader power system, load or generation.
Rectification	<p>Transgrid tested the Silverton Wind Farm TTS communication paths prior to returning the scheme to service. All communication paths were proven to be fully operational, and no other errors or issues were identified during testing.</p> <p>Transgrid has also confirmed that since this incident, there have been multiple instances of storm activity over the Broken Hill – Buronga X2 220 kV line where the Silverton Wind Farm TTS has not operated unexpectedly. In addition, there is no history of Silverton Wind Farm TTS maloperation during storm activity.</p> <p>Based on the above information Transgrid has confirmed that this event is unlikely to re-occur.</p>
Power system security	The power system remained in a secure operating state throughout this incident and the Frequency Operating Standard ⁶ was met.
Reclassification	<p>AEMO assessed whether to reclassify this incident as a credible contingency event⁷.</p> <p>The cause of this incident was identified by Transgrid and the equipment was returned to service with the faulty Silverton Wind Farm TTS isolated. Transgrid investigated the Silverton Wind Farm TTS and confirmed the scheme was unlikely to mal-operate again before returning the scheme to service, therefore AEMO correctly identified that reclassification was not required.</p>
Market information	<p>For this incident, AEMO issued the following market notices, which were issued in accordance with NER requirements:</p> <ul style="list-style-type: none"> • AEMO issued Market Notice 91278 at 2340 hrs on 28 September 2021 – To advise of non-credible contingency event. • AEMO issued Market Notice 91281 at 0915 hrs on 29 September 2021 – Advising that the cause of the non-credible contingency had been identified.
Conclusions	<p>AEMO has concluded that:</p> <ol style="list-style-type: none"> 1. The trip of the Broken Hill – Silverton X6 220 kV line, the Silverton 220 kV/33 kV transformer and the Broken Hill Solar Farm and the disconnection of the Silverton Wind Farm were caused by the maloperation of the Silverton Wind Farm TTS. 2. AEMO correctly identified there was no requirement to reclassify this incident as a credible contingency. 3. The power system remained in a secure operating state throughout this incident and the Frequency Operating Standard was met. 4. Transgrid tested the Silverton Wind Farm TTS communication paths prior to returning the scheme to service. All communication paths were proven to be fully operational, and Transgrid has confirmed the event is unlikely to re-occur.
Recommendations	AEMO to share the findings of this report with the Power System Security Working Group in early 2022.

⁶ Please see https://www.aemc.gov.au/sites/default/files/2020-01/Frequency_operating_standard_-_effective_1_January_2020_-_TYPO_corrected_19DEC2019.PDF.

⁷ 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 Post-incident diagram (all elements in-service prior to the event)

