
Trip of the Wallerawang 330 kV Generation Busbar on 22 March 2019

October 2019

Reviewable Operating Incident Report under the
National Electricity Rules

INCIDENT CLASSIFICATIONS

Classification	Detail
Time and date of incident	0628 hrs on 22 March 2019
Region of incident	New South Wales
Affected regions	New South Wales
Event type	Inadvertent protection operation
Generation impact	No generating unit was disconnected or had its output limited as a result of this incident
Customer load impact	No customer load was disconnected as a result of this incident
Associated reports	Nil

ABBREVIATIONS

Abbreviation	Term
AEMO	Australian Energy Market Operator
AEST	Australian Eastern Standard Time
CB	Circuit Breaker
HV	High voltage
kV	Kilovolt
NEM	National Electricity Market
NER	National Electricity Rules
TNSP	Transmission Network Service Provider

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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Contents

1.	Overview	5
2.	The incident	5
2.1	The incident	5
2.2	TransGrid investigation	6
3.	Power system security	7
3.1	Reclassification	7
4.	Market information	7
5.	Conclusions	8
A1.	System diagram	9

1. Overview

This report relates to a reviewable operating incident¹ that occurred on 22 March 2019 in New South Wales. The incident involved the trip of the Wallerawang 330 kilovolt (kV) Generation busbar.

No generation or customer load was lost as a result of this incident.

As this was a reviewable operating incident, AEMO is required to assess the adequacy of the provision and response of facilities and services and the appropriateness of actions taken to restore or maintain power system security².

AEMO has concluded that:

1. The trip of the Wallerawang 330 kV Generation busbar was the result of the inadvertent operation of redundant protection systems. There was no high voltage (HV) fault on the network.
2. The root cause of the protection operation could not be determined.
3. TransGrid has isolated redundant protection systems associated with the de-commissioned generating units at Wallerawang Power Station.
4. TransGrid has also isolated all of the other redundant protection systems between the power station and the substation.
5. AEMO correctly determined that reclassification of the Wallerawang 330 kV Generation busbar as a credible contingency was not required.
6. The power system remained in a secure operating state throughout this incident.

This report is prepared in accordance with clause 4.8.15(c) of the National Electricity Rules (NER). It is based on information provided by TransGrid³ and AEMO.

National Electricity Market (NEM) time (Australian Eastern Standard Time [AEST]) is used in this report. At the time of this incident, local time in New South Wales was AEST plus one hour.

2. The incident

2.1 The incident

At 0628 hrs on 22 March 2019, the Wallerawang 330 kV Generation busbar tripped. Refer to Appendix A1 for a diagram of the Wallerawang substation immediately after the incident. Normally for a trip of this busbar, circuit breaker (CB) 5422 would be expected to open. However, after the recent de-commissioning of the No. 2 330/132 kV transformer, modifications were made to the busbar protection so that CB 5032 would trip instead of CB 5422.

The busbar was returned to service at 1700 hrs on 22 March 2019.

¹ 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.

² See NER clause 4.8.15(b).

³ TransGrid is a Transmission Network Service Provider (TNSP) in New South Wales.

2.2 TransGrid investigation

The following is based on information provided by TransGrid.

At 0628 hrs on 22 March 2019, the Wallerawang 330 kV Generation busbar tripped due to operation of the busbar protection. An initial review by TransGrid field staff showed no HV fault on the busbar and all protection was reset. An attempt was made to restore the busbar at 1541 hrs on 22 March 2019 by closing CB 5282. While this was successful, the busbar tripped again approximately three minutes later when CB 5272 was closed.

Circuit breakers 5272 and 5012 were then isolated pending further investigation and the busbar returned to service via the remaining CBs at 1700 hrs on 22 March 2019.

Further investigation by TransGrid revealed the busbar protection had operated as a result of an output from the Local Backup protection. A review of the inputs to the Local Backup protection revealed inputs from the trip circuits of the de-commissioned generating units at Wallerawang Power Station. TransGrid was able to determine that protection relays associated with the de-commissioned No. 7 generating unit at Wallerawang Power Station had operated but power station staff were not able to determine why the relays had operated.

TransGrid isolated the inputs to the Local Backup protection from both the de-commissioned No. 7 and No. 8 generating units at Wallerawang Power Station and returned CBs 5272 and 5012 to service at 0832 hrs on 2 April 2019.

All protection operated as designed and as expected for the inputs provided.

Given the Wallerawang Power Station was closed in 2015, AEMO understood that any redundant protection systems associated with the power station which would have the potential to impact on equipment in the Wallerawang substation would have been isolated or disconnected. TransGrid has advised AEMO this is not the case, for a number of reasons.

Because both the power station and the substation were designed and built by the Electricity Commission of New South Wales, the equipment and systems at the two sites are highly integrated. The differential protection covering the transmission lines and associated switchgear between the substation and the generating units is located in the power station but uses inputs from the current transformers in the substation. The protection relays were left in place after decommissioning to ensure this equipment was protected from faults until it could be removed under an agreed project between Energy Australia and TransGrid. When decommissioning work commenced at the power station, TransGrid advised Energy Australia of these protection systems and the need for them to remain operational.

At the power station, the generator protection scheme has outputs into the substation busbar protection, via the Local Backup protection, to provide backup protection to the generating units. As noted above, it was this protection that tripped the 330 kV busbar. Although TransGrid was not able to conclusively determine why these generating unit protection outputs were still in place, it advises the most likely cause is that these outputs were missed during the decommissioning process, because there are not normally inputs to the busbar protection scheme from generating units.

TransGrid has now isolated the outputs from the generating unit protection that feed into the substation busbar protection. While the differential protection scheme is still in service at the power station, this will only trip the relevant bay CBs and not the entire busbar unless one of the bay CBs fails to open.

TransGrid initiated a program to remove all other wiring between the Wallerawang Power Station and the Wallerawang substation to prevent similar issues occurring. This work was completed on 26 June 2019.

3. Power system security

AEMO is responsible for power system security in the NEM. This means AEMO is required to operate the power system in a secure operating state to the extent practicable and take all reasonable actions to return the power system to a secure state following a contingency event in accordance with the NER⁴.

The power system was in a secure operating state prior to this incident and remained in a secure operating state for the duration of the incident. AEMO was not required to take any actions in relation to power system security for this incident.

3.1 Reclassification

AEMO assessed whether or not to reclassify this incident as a credible contingency event⁵.

As the cause of the trip had been identified and isolated prior to the Wallerawang 330 kV Generation busbar being returned to service, and TransGrid had advised AEMO that a reoccurrence of the incident was unlikely, AEMO correctly determined that reclassification of the Wallerawang 330 kV Generation busbar as a credible contingency event was not required.

4. Market information

AEMO is required by the NER and operating procedures to inform the market about incidents as they progress. This section assesses how AEMO informed the market⁶ over the course of this incident.

For this incident, AEMO informed the market on the following matters:

1. A non-credible contingency event – notify within two hours of the event⁷.
 - AEMO issued Market Notice 67842 at 0702 hrs on 22 March 2019, 34 minutes after the event, to advise of the non-credible contingency event.
2. Reclassification, details, and cancellation of a non-credible contingency – notify as soon as practical⁸.
 - AEMO issued Market Notice 67850 at 1708 hrs on 22 March 2019 to advise that the Wallerawang 330 kV Generation busbar had been returned to service and that, because the cause of the trip had been identified and isolated, AEMO would not reclassify the incident as a credible contingency.

⁴ Refer to AEMO's functions in section 49 of the National Electricity Law and the power system security principles in clause 4.2.6 of the NER.

⁵ 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).

⁶ AEMO generally informs the market about operating incidents as the progress by issuing Market Notices – see <https://www.aemo.com.au/Market-Notices>.

⁷ AEMO is required to notify the Market of a non-credible contingency event within two hours of the event – AEMO, Power System Security Guidelines, Section 10.3, available at [SO_OP3715 Power System Security Guidelines](#).

⁸ AEMO is required to notify the market of a reclassification – NER clause 4.2.3(g), details of the reclassification – 4.2.3(c), and when AEMO cancels the reclassification – 4.2.3(h).

5. Conclusions

AEMO has assessed this incident in accordance with clause 4.8.15(b) of the NER. In particular, AEMO has assessed the adequacy of the provision and response of facilities or services, and the appropriateness of actions taken to restore or maintain power system security.

AEMO has concluded that:

1. The trip of the Wallerawang 330 kV Generation busbar was the result of the inadvertent operation of redundant protection systems. There was no HV fault on the network.
2. The root cause of the protection operation could not be determined.
3. TransGrid has isolated redundant protection systems associated with the de-commissioned generating units at Wallerawang Power Station.
4. TransGrid has also isolated all of the other redundant protection systems between the power station and the substation.
5. AEMO correctly determined that reclassification of the Wallerawang 330 kV Generation busbar as a credible contingency was not required.
6. The power system remained in a secure operating state throughout this incident.

A1. System diagram

The diagram below provides an overview of the Wallerawang substation immediately after the incident.

