



Trip of New Osborne 66 kV Busbar on 11 November 2020

May 2021

Reviewable Operating Incident Report under the
National Electricity Rules

INCIDENT CLASSIFICATIONS

Classification	Detail
Time and date of Incident	0849 hrs on 11 November 2020
Region of incident	South Australia
Affected regions	South Australia
Event type	Environmental - Other
Generation impact	63 MW
Customer load impact	Nil
Associated reports	Nil

ABBREVIATIONS

Abbreviation	Term
AEMC	Australian Energy Market Commission
AEMO	Australian Energy Market Operator
AEST	Australian Eastern Standard Time
APD	Alcoa Portland
CB	Circuit Breaker
CT	Current Transformer
kV	Kilovolt/s
MW	Megawatt/s
NEM	National Electricity Market
NER	National Electricity Rules
ST	Steam Turbine
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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1. Overview

This report relates to a reviewable operating incident¹ that occurred on 11 November 2020 in South Australia (SA). The incident involved the trip of New Osborne 66 kilovolt (kV) Zone 3 Busbar (Osborne bus).

There was a loss of 63 megawatts (MW) of generation and no load 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. New Osborne 66 kV Zone 3 busbar tripped due to a single phase to earth fault caused by a flashover on phase 'A' of CT associated with CB 5537.
2. The incident resulted in disconnection of Osborne Cogen Steam Turbine (ST-1).
3. The root cause of the flashover was the debris from a bird's nest which existed on the top of CT 5537.
4. The power system remained in a secure operating state through 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 ElectraNet³ and AEMO.

National Electricity Market (NEM) time (Australian Eastern Standard Time [AEST]) is used in this report.

2. The incident

2.1 Pre-incident

Prior to this incident, at 0333 hrs on 11 November 2020, there was an unplanned outage of the Heywood – Mortlake tee Alcoa Portland (APD) No.2 500 kV line, and the 500 kV 213 circuit breaker (CB) at the Heywood substation. This outage put the Victoria and South Australia regions at credible risk of separation for a single contingency event.

AEMO was aware that any loss of synchronous generating units in South Australia would lead to a potential system strength issue in South Australia and advised AusNet Services⁴ that AEMO may direct synchronous generation in South Australia for system strength support. AEMO highlighted that it required a prompt update on the condition of CB 213 and its likely return to service time. The Heywood – Mortlake No. 2 500 kV line and CB 213 were returned to service at around 1145 hrs on the same day.

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 ElectraNet is the transmission network service provider (TNSP) in South Australia.

⁴ AusNet is the transmission asset owner in Victoria.

2.2 The incident

At 0819 hrs on 11 November 2020, a flashover occurred on the outside of the CT on the Zone 3 busbar side of CB 5537 at New Osborne 66 kV substation, which resulted in the operation of Zone 3 differential protection on the Osborne 66 kV bus. The earth leakage protection of CB 5537 also operated during the incident.

The incident resulted in the tripping of all CBs connected to Zone 3 of New Osborne bus, with 66 kV feeders Lefevre-1, Lefevre-2, and Blackpool remaining energised from the remote ends. Osborne Cogen ST-1 also disconnected incident.

Feeders Lefevre-1, Lefevre-2, and Blackpool returned to service at around 0911 hrs on 11 November 2020 and the connection to the Osborne ST-1 was restored at around 0926 hrs on 11 November 2020. CB 5537 returned to service on 1546 hrs on 16 November 2020, after the completion of inspection and testing.

2.3 Analysis

The following is based on information provided by ElectraNet.

At 0819 hrs on 11 November 2020, a flashover occurred on the outside of the CT adjacent to CB 5537 resulting in an 'A' phase to earth fault at the New Osborne 66 kV bus. All protection operated correctly to clear the fault within 60 milliseconds (ms). Figure 1 shows the network configuration immediately after the fault.

The incident resulted in the tripping of all CBs connected to Zone 3 of New Osborne bus. The feeders Lefevre-1, Lefevre-2, and Blackpool tripped from the New Osborne end but remained energised from the remote ends. Osborne Cogen ST-1 tripped from 63 MW due to loss of connection to the power system.

ElectraNet carried out a site inspection and identified flash burns on the CB 5537 CT. Subsequent detailed inspection of the CT revealed a bird's nest within the top section of this CT as the likely cause of the fault.

This type of CT has a large open cover over the rubber bellows at the top of the CT (see Figure 2.) which provides a convenient nesting site for birds. ElectraNet is investigating methods to prevent birds from entering this location on these CTs.

Feeders Lefevre-1, Lefevre-2, and Blackpool returned to service at around 0911 hrs on 11 November 2020, and the OCPL2 connection was restored at around 0926 hrs on 11 November 2020. CB 5537 returned to service on 1546 on 16 November 2020, after the completion of inspection and testing.

Figure 1 Simplified post-fault single line diagram of 66 kV Osborne substation

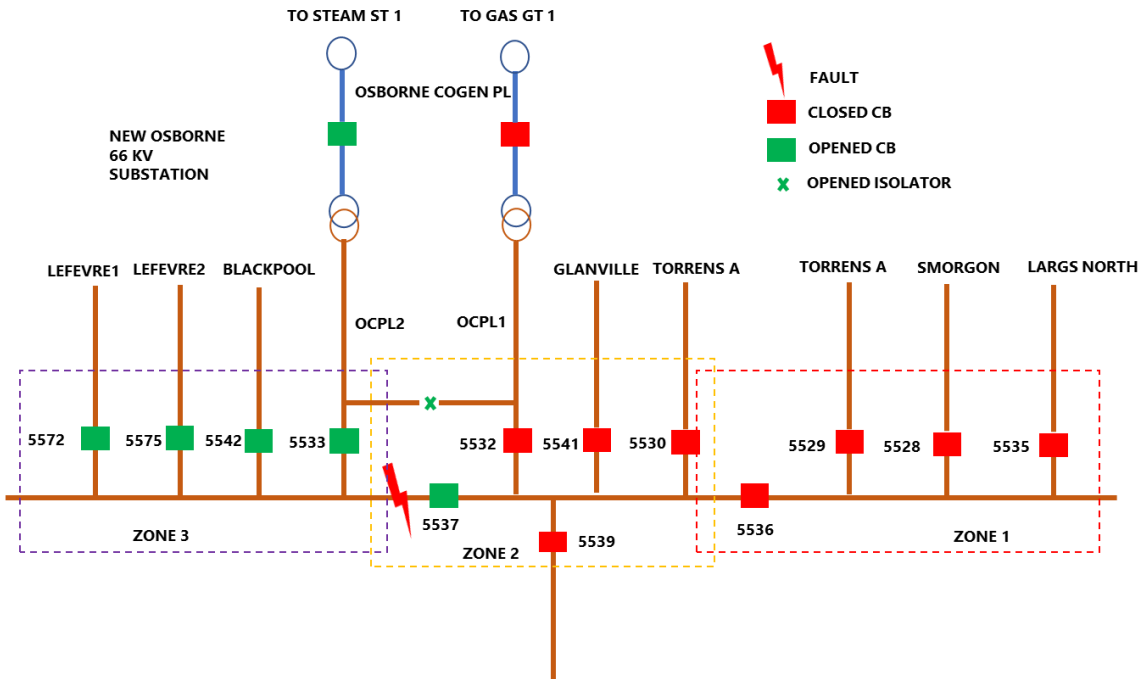


Figure 2 CT 5337 (left) and the bird's nest (right) on the top of this CT



Images provided by ElectraNet.

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 NER⁵.

Prior to this incident, the South Australia region was at credible risk of separation due to the unplanned outage of Heywood – Mortlake tee APD No. 2 500 kV Line and CB 213 at the Heywood substation end.

During the unplanned outage of the Heywood – Mortlake tee Alcoa Portland (APD) No.2 500 kV line, and the 500 kV 213 circuit breaker (CB) at the Heywood substation on 11 November 2020, a trip of the Osborne bus occurred. The event resulted in disconnection of OCPL ST-1 at 0819 hrs, and the Osborne aggregate

⁵ 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.

generating unit⁶ was subsequently bid unavailable at 0826 hrs. This reduced the number of synchronous generators in South Australia, leading to a potential system strength shortfall.

At 0850 hrs, AEMO gave a direction in accordance with NER clause 4.8.9(a) to Origin Energy Electricity Ltd to synchronise Quarantine Power Station Unit 5 and follow the dispatch target to resolve the South Australia system strength shortfall. Quarantine Power Station Unit 5 takes a minimum of 21 minutes to synchronise and was synchronised at around 0920 hours.

The direction to Origin Energy Electricity Ltd was cancelled at 1215 hrs on the same day when the risk of South Australia – Victoria separation was mitigated with the restoration of Heywood – Mortlake tee APD No. 2 500 kV Line and CB 213 at around 1145 hrs on 11 November 2020.

The power system remained in a secure operating state through this incident.

3.1 Reclassification

AEMO assessed whether to reclassify this incident as a credible contingency event⁷.

AEMO was advised by ElectraNet that the cause of the incident had been identified and the failed equipment had been isolated prior to restoration of the Osborne busbar. As such, AEMO correctly did not classify this non-credible contingency as a credible contingency event.

4. Market information

Since this event did not occur within the transmission network, AEMO was not required by the NER to issue Market Notices in relation to this event. Furthermore, as the event did not have a material impact on the operation or security of the power system, AEMO determined not to issue any discretionary market notices.

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. New Osborne 66 kV Zone 3 busbar tripped due to a single phase to earth fault caused by a flashover on phase 'A' of CT associated with CB 5537.
2. The incident resulted in disconnection of Osborne Cogen Steam Turbine (ST-1).
3. The root cause of the flashover was the debris from a bird's nest which existed on the top of CT 5537.
4. The power system remained in a secure operating state through this incident.

⁶ The Osborne aggregate generating unit consists of the Osborne gas turbine and Osborne steam turbine. These units are dispatched in the market system as a single generating unit.

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).

6. Recommendations

AEMO notes challenges relating to condition monitoring, and the potential for external factors such as bushfire ash, weeds, debris, birds and vermin to result in equipment failures and supply interruptions. This has been demonstrated through numerous reviewable and non-reviewable events. In relation to the specific observations from this event, AEMO recommends that asset owners review their site inspection procedures to identify potential CT failures of this type. AEMO plans to discuss this topic with other NSPs through Power System Security Working Group (PSSWG) in mid-2021.