220 kV Busbar Trip at Eildon Power Station on 19th February 2017

REVIEWABLE OPERATING INCIDENT REPORT UNDER THE NATIONAL ELECTRICITY RULES

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AEMO
AUSTRALIAN ENERGY MARKET OPERATOR

INCIDENT CLASSIFICATIONS

Classification	Detail
Time and date of incident	0754 hrs Sunday 19 February 2017
Region of incident	Victoria
Affected regions	Victoria
Event type	Busbar trip (BB)
Generation Impact	Eildon No. 1 Generator was unable to connect to the grid as a result of this incident.
Customer Load Impact	No customer load was disconnected as a result of this incident.
Associated reports	Nil

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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1. OVERVIEW

This report relates to a reviewable operating incident[1] that occurred on Sunday 19 February 2017 at Eildon Power station (EPS) in Victoria. This incident involved the trip of the No.2 220kV busbar.

There was no loss of customer load or any generation as a result of this incident.

As a reviewable operating incident, AEMO is required to assess power system security over the course of this incident, and assess the adequacy of the provision and response of facilities and services and the appropriateness of actions taken to restore or maintain power system security.[2]

AEMO has concluded that:

- The trip of the No. 2 220 kV busbar at EPS was caused by the failure of No. 1 Generator Transformer No. 2 Bus 220 kV circuit breaker.
- All protection systems operated as designed and as expected.
- The power system remained in a secure operating state during this incident.
- AEMO notified the market about this incident appropriately and in timely manner.
- The cause of incident was identified and AEMO was satisfied that reoccurrence of this incident was unlikely, therefore this incident was not reclassified as credible contingency.

This report is prepared in accordance with clause 4.8.15 of the National Electricity Rules (NER). It is based on information provided by AEMO, AGL and AusNet Services (AusNet)[3].

Australian Eastern Standard Time (AEST) is used in this report. Local time in Victoria in February is AEST plus one hour.

2. THE INCIDENT

On Sunday 19 February 2017 at 0754 hrs, while synchronising the Eildon Power Station No1 generating unit, the No. 2 220 kV busbar at EPS tripped resulting in offloading of the Eildon – Mount Beauty No1 220 kV transmission line (MBTS 1 line). Refer to Appendix A for a diagram of EPS immediately after the event.

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

The No. 2 busbar and MBTS 1 line were returned to service at 0914 hrs on 19 February 2017.

The probability of a busbar fault is very low and so is an unexpected event known in power system security terms as a non-credible contingency event[4].

3. PARTICIPANT INVESTIGATION

The following is based on information provided by AusNet.

The trip of the No2 busbar was caused by the failure of the No. 1 Generator Transformer No. 2 Bus 220 kV circuit breaker (CB) when the Eildon No. 1 generating unit was attempting to synchronise to the grid.

Information obtained from the protection relays indicated a fault current of around 1.4kA peak on the white phase of the No. 1 Generator Transformer No. 2 Bus 220 kV CB. The fault was cleared by the circuit breaker fail protection (CBF). AusNet advised that the CBF has an intentional time delay of 200

[1] See NER clause 4.8.15
[2] See NER clause 4.8.15(b).
[3] Information provided by AusNet Services has been provided on a without prejudice basis and nothing in this report is intended to constitute, or may be taken by any person as constituting, an admission of fault, liability, wrongdoing, negligence, bad faith or the like on behalf of AusNet Services (or its respective associated companies, businesses, partners, directors, officers or employees).
[4] NER Clause 4.2.3 - Credible and non-credible contingency events; AEMO Power System Security Guidelines, Section 10 - Definition of a non-credible contingency events

ms and the CB opened 51 ms after this time delay, clearing the fault after 251 ms. This means the CBF protection and transmission equipment operated correctly to clear the fault within 430 ms as required by the NER[5].

The failed CB was isolated and the busbar returned to service at 0914 hrs on 19 February 2017.

Inspection and testing by AusNet Services determined that the white phase of the No. 1 Generator Transformer No. 2 Bus 220 kV CB had failed and required replacement. The circuit breaker was isolated for repair and restored into service at approximately 1500 hrs on the 23 February 2017.

4. POWER SYSTEM SECURITY

AEMO is responsible for power system security in the National Electricity Market (NEM). This means AEMO is required to operate the power system in a secure operating state to the extent practicable and to take all reasonable actions to return the power system to a secure state following a contingency event in accordance with the NER.[6]

AEMO invoked constraint sets V-EPMB[7] and V-EP_BUS2[8] between 0800 hrs and 0935 hrs on 19 February 2017. This ensured that the power system was returned to and maintained in a secure operating state during this incident. No other actions were required by AEMO to maintain power system security during this incident.

4.1 Reclassification

After the No.2 220kV busbar at EPS had been returned to service, AEMO assessed whether or not to reclassify the event as a credible contingency event[9]. For this incident, AEMO was satisfied that the cause had been identified and isolated so that the incident was unlikely to reoccur.

For this incident, the power system remained in a secure operating state over the course of the incident. Power system frequency[10] and voltages[11] stayed within the limits and the fault was cleared within required timeframes. AEMO correctly assessed the incident and did not reclassify the incident as a credible contingency event.

5. MARKET INFORMATION

AEMO is required by the NER and the operating procedures to inform the market about incidents as they progress. This section assesses how AEMO informed the market[12] over the course of this incident.

For this incident, AEMO was required to inform the market on the following matters:

1. The occurrence of a non-credible contingency event - notify within two hours of the event.[13]
    - AEMO issued Market Notice 57601 at 0920 hrs – 86 minutes after the event.

2. Constraints invoked with interconnector terms on the LHS.[14]
    - AEMO is required to advise the market whenever a constraint is invoked for a short notice or unplanned outage, if that constraint has interconnector terms on the left hand

[5] See NER clause S5.1a8.
[6] 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
[7] Out = Eildon to Mt. Beauty 220kV line.
[8] Out = Eildon PS No2 220kV busbar
[9] 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 re-classification criteria were applied - NER Clause 4.8.15 (ca)
[10] Operating Frequency Tolerance Band specified in AEMC Reliability Panel Frequency Operating Standards
[11] NER Schedule 5.1a System Standards Clause S5.1a.4 - Power frequency voltage
[12] AEMO generally informs the market about operating incidents as the progress by issuing Market Notices – see AEMO website
[13] 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
[14] For short term outage AEMO is required to notify the Market of variances to interconnector transfer limits AEMO, Power System Security Guidelines, Section 22

side. AEMO issued Market Notice 57600 at 0817 hrs to advise the market that constraint sets V-EPMB and V-EP_BUS2 had been invoked. Constraint equations within these constraint sets have interconnector terms on the left hand side.

No other notifications were required.

6. CONCLUSIONS

AEMO has assessed this incident in accordance with clause 4.8.15 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:

- The trip of the No. 2 220 kV busbar at EPS was caused by the failure of No. 1 Generator Transformer No. 2 Bus 220 kV circuit breaker.
- All protection systems operated as designed and as expected.
- The power system remained in a secure operating state during this incident.
- AEMO had notified the market about this incident appropriately and in timely manner.
- The cause of incident was identified and AEMO was satisfied that reoccurrence of this incident was unlikely, therefore this incident was not reclassified as credible contingency.

APPENDIX A – POWER SYSTEM DIAGRAM

The diagram below shows the status at Eildon Power Station immediately after the event.