TRIP OF JEERALANG NO. 1 220 KV BUSBAR ON 7 APRIL AND 10 APRIL 2016

AN AEMO POWER SYSTEM OPERATING INCIDENT REPORT FOR THE NATIONAL ELECTRICITY MARKET

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AEMO
AUSTRALIAN ENERGY MARKET OPERATOR

INCIDENT CLASSIFICATIONS

Classification	Detail
Time and date of incidents	0926 hrs on 7 April 2016 2005 hrs on 10 April 2016
Region of incidents	Victoria
Affected regions	Victoria
Event type	BB – Busbar trip
Generation Impact	No generation was lost as a result of these incidents
Customer Load Impact	No customer load was disconnected as a result of these incidents
Associated reports	Nil

ABBREVIATIONS

Abbreviation	Term
AEMO	Australian Energy Market Operator
kV	Kilovolt
MW	Megawatt
NER	National Electricity Rules
JLGS	Jeeralang Power Station
JLTS	Jeeralang Terminal Station
HWPS	Hazelwood Power Station
MWTS	Morwell Terminal Station

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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CONTENTS

1. OVERVIEW

This report relates to reviewable operating incidents[1] that occurred on Thursday 7 April 2016 and Sunday 10 April 2016 at Jeeralang Terminal Station (JLTS) in Victoria. These incidents involved the trip of the JLTS No. 1 220 kV busbar and were caused by a faulty circuit breaker (CB) at the Jeeralang Power Station. There was no loss of generation or customer load as a result of these incidents.

As these were reviewable operating incidents, AEMO is required to assess power system security over the course of these incidents, 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]

For these incidents, AEMO has concluded that:

1. The trip of the JLTS No. 1 220 kV busbar in both incidents was caused by a faulty CB on the B2 generating unit at Jeeralang Power Station.
   - Ecogen Energy has repaired the faulty CB and instigated additional maintenance processes to reduce the probability of a reoccurrence.
2. The provision and response of the facilities and services were appropriate and power system security was maintained over the course of both incidents.

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 Ecogen and AusNet Services[3].

Australian Eastern Standard Time is used in this report.

2. THE INCIDENT

On 7 April 2016 at 0926 hrs, the JLTS No. 1 220 kV busbar tripped during the normal shutdown of the B2 generating unit at JLGS. As a result of this trip, the Hazelwood Power Station (HWPS)–JLTS No. 1 220 kV transmission line was offloaded. Due to the planned outage of the HWPS–JLTS No. 3 220 kV line and the associated CBs at JLTS, the Morwell (MWTS) –JLTS No. 2 220 kV transmission line was also offloaded.

At 1020 hrs on 7 April the JLTS No. 1 220 kV busbar and the HWPS–JLTS No.1 and JLTS–MWTS No.2 220 kV transmission lines were returned to service. The JLGS B2 generator CB was isolated for further inspection and testing and was returned to service at 1600 hrs on 7 April.

On 10 April 2016 at 2005 hrs the JLTS No. 1 220 kV busbar tripped again during the normal shutdown of the B2 generating unit at JLGS. As a result of this trip, the HWPS–JLTS No. 1 220 kV transmission line was offloaded.

At 2057 hrs on 10 April, the JLTS No. 1 220 kV busbar and the HWPS–JLTS No. 1 220 kV transmission line were returned to service with the JLGS B2 generator CB isolated for further inspection. After repairs the CB was returned to service on 13 April.

[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] 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).

No customer load or generation was lost as a result of either of these incidents. See Appendix A for a power system diagram illustrating the incidents and Appendix B for a chronological log of these incidents.

The reason for investigating this incident is that a busbar tripped. The probability of a busbar fault is very low, and is thereby an unexpected event known in power system security terms as a non-credible contingency[4].

3. PARTICIPANTS INVESTIGATION

3.1 AusNet Services

AusNet Services, as the operator of the Jeeralang terminal station, advised that the trip of the JLTS No. 1 220 kV busbar in both incidents was caused by equipment faults at the Jeeralang Power Station. Equipment owned by AusNet Services operated correctly.

3.2 Ecogen Energy

Ecogen Energy is the operator of Jeeralang Power Station and has provided the following information.

On 7 April 2016, the JLTS No. 1 220 kV busbar tripped during the normal shutdown of the B2 generating unit at Jeeralang Power Station. This trip was initiated by the “Y” protection on the B2 generating unit following the failure of the 10.5 kV generator CB to open during the shutdown process. This is the correct protection operation and subsequent outcome for this type of event.

Inspection of the CB revealed that one of the two trip coils had become loose, rendering it ineffective. The trip coil was refitted and adjustments were made to the CB tripping mechanism. After timing checks, the CB was found to operate as per design and was returned to service at 1600 hrs on 7 April 2016.

On 10 April 2016, the JLTS No. 1 220 kV busbar tripped again during a normal shutdown of the B2 generating unit at Jeeralang Power Station. As in the event on 7 April, the trip was initiated by the “Y” protection on the B2 generating unit following a failure of the 10.5 kV generator CB to open during this shutdown process. This is the correct protection operation and subsequent outcome for this type of event.

The CB trip coils were inspected and found to be operating correctly. The CB control mechanism was inspected and lubricated. Timing checks were again carried out, which showed an improvement over the results from 7 April. Subsequently this CB was returned to service on 13 April. The B2 generating unit CB has functioned correctly on all subsequent generating unit shutdowns.[5] However, more comprehensive maintenance work on the generator CB is scheduled for September/October 2016.

As an outcome of these incidents, Ecogen Energy has implemented annual inspection and timing tests on the Jeeralang B generating unit CBs.

[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 event, available at https:/www.aemo.com.au/Electricity/National-Electricity-Market-NEM/Security-and-reliability/Power-system-operation.

[5] There were 33, B2 unit shutdowns between 13 April and 20 July 2016.

4. 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 and return the power system to a secure state following a contingency event. This section assesses how AEMO managed power system security over the course of these incidents.[6]

For both incidents, AEMO correctly invoked constraint set "V-JL_BUS1".[7] On 7 April, this constraint set was invoked at 0940 hrs, 14 minutes after the event and on 10 April it was invoked at 2015 hrs, 10 minutes after the event.

During the 7 April event, AEMO's Contingency Analysis (CA) tool indicated that the B1 220/66kV transformer at MWTS would have been overloaded if the HWPS–MWTS 220 kV line had tripped. To manage this issue, AEMO confirmed with AusNet Services that the Overload Shedding Scheme for Connection Assets (OSSCA)[8] was armed at MWTS.

These actions ensured that the power system was returned to, and then maintained in, a secure operating state during these events.

4.1 Reclassification

In accordance with clause 4.2.3A of the NER, AEMO considered whether to reclassify this non-credible contingency event as a credible contingency event.

After the event on 7 April, Ecogen Energy advised AEMO that the faulty CB had been repaired and was fully operational. AEMO was satisfied that the non-credible contingency event was unlikely to reoccur, and so did not reclassify it as a credible contingency event.

After the event on 10 April, Ecogen Energy advised AEMO that the cause of the contingency was known and the faulty CB had been isolated pending repair. AEMO was satisfied that the non-credible contingency event was unlikely to reoccur, and so did not reclassify it as a credible contingency event.

When the B2 generating unit was returned to service on 14 April 2016, AEMO then assessed whether or not to reclassify the event as a credible contingency. As AEMO had not been advised that the CB fault had been identified and repaired, AEMO was not satisfied that the cause had been identified and that the incident was unlikely to reoccur. At 1545 hrs on 14 April, AEMO reclassified the simultaneous trip of the B2 generating unit at Jeeralang Power Station and the JLTS No.1 220 kV busbar as a credible contingency event. No constraint sets are required as part of this reclassification.

On 2 June 2016, Ecogen Energy advised AEMO that repairs had been made to the B2 generating unit CB and the CB was operating correctly. As a result, AEMO no longer considered the simultaneous trip of Jeeralang B2 generating unit and Jeeralang No.1 220 kV busbar to be a credible contingency event from 1635 hrs on 3 Jun 2016.

[6] AEMO is responsible for power system security in the NEM and is required to operate the power system in a secure operating state (NER Clause 4.2.4 (a)). AEMO must thereby ensure that the power system is maintained in, or returned to, a secure operating state following a contingency event.
[7] "V_JL_BUS1" limits the generation output of all B generating units at Jeeralang Power Station to zero.
[8] OSSCA is a control scheme that will automatically shed load if a transformer is overloaded.

5. 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 market[9] over the course of these incidents.

For these incidents, AEMO was required to inform the market on the following matters:

1. A non-credible contingency event – notify within two hours of the event.[10]
   - AEMO issued Market Notice 52700 at 1009 hrs on 7 April 2016 – 43 minutes after the first incident.
   - AEMO issued Market Notice 52751 at 2059 hrs on 10 April 2016 – 54 minutes after the second incident.
2. Reclassification, details, and cancellation of a non-credible contingency – notify as soon as practical.[11]
   - AEMO issued Market Notice 52811 at 1558 hrs on 14 April, with information about the likelihood of the event reoccurring and reclassifying the event as a credible contingency.
   - AEMO issued Market Notice 52813 at 1728 hrs on 14 April, to clarify the information in Market Notice 52811.
   - AEMO issued Market Notice 53600 at 1644 hrs on 3 June 2016, cancelling the reclassification of the event as a credible contingency.

Over the course these incidents AEMO informed the market as required with appropriate and timely information.

6. CONCLUSIONS

AEMO has assessed these incidents 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 concluded that:

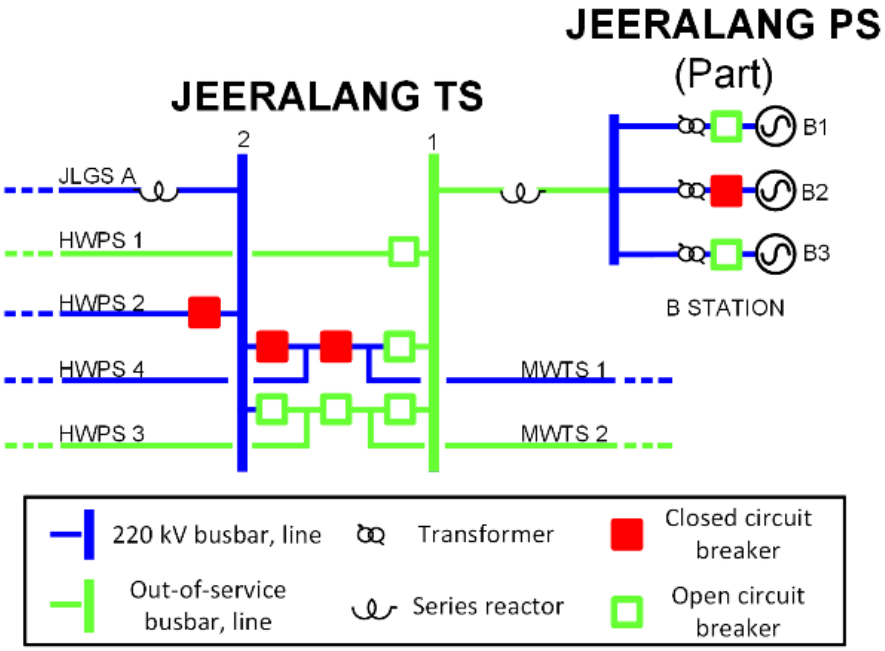
1. The trip of the JLTS No. 1 220 kV busbar in both incidents was caused by a faulty CB on the B2 generating unit at Jeeralang Power Station.
   - Ecogen Energy has repaired the faulty CB and instigated additional maintenance processes to reduce the probability of a reoccurrence.
2. The provision and response of the facilities and services were appropriate and power system security was maintained over the course of both incidents.

[9] AEMO generally informs the market about operating incidents as the progress by issuing Market Notices – see AEMO website at https://www.aemo.com.au/Electricity/National-Electricity-Market-NEM/Market-notices-and-events.
[10] 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.
[11] 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 – NER clause 4.2.3(h).

APPENDIX A. – POWER SYSTEM DIAGRAM

Figure 1 The status of affected power system elements following the incident on 7 April 2016

Note that the HWPS–JLTS No. 3 220 kV transmission line was already out of service prior to this incident. On 10 April, the HWPS–JLTS No.3 220kV line was in service so the JLTS-MWTS No2 220kV line also remained in service after the trip of the busbar.



APPENDIX B. – INCIDENT EVENT LOG

Chronological Log of Incidents

Table 1 Incident chronology – 7 April 2016

Time and Date	Event
0926 hrs 7 April 2016	Jeeralang No 1 220 kV busbar tripped
0940 hrs	Constraint set V-JL_BUS1 invoked
1009 hrs	Market Notice 52700 issued for – Non-credible contingency event
1020 hrs	Jeeralang (JLTS) No.1 220 kV busbar was returned to service
1030 hrs	Constraint set V-JL_BUS1 revoked

Table 2 Incident chronology – 10 April 2016

Time and Date	Event
2005 hrs 10 April 2016	Jeeralang No 1 220 kV busbar tripped
2015 hrs	Constraint set V-JL_BUS1 invoked
2057 hrs	Jeeralang (JLTS) No.1 220 kV busbar was returned to service
2059 hrs	Market Notice 52751 issued for – Non-credible contingency event
2105 hrs	Constraint set V-JL_BUS1 revoked
1125 hrs 14 April	B2 unit at Jeeralang Power Station was returned to service
1558 hrs 14 April	Market Notice 52811 issued advising of reclassification
1728 hrs 14 April	Market Notice 52813 issued advising of updated information about reclassification
1644 hrs 3 June	Market Notice 53600 issued cancelling reclassification