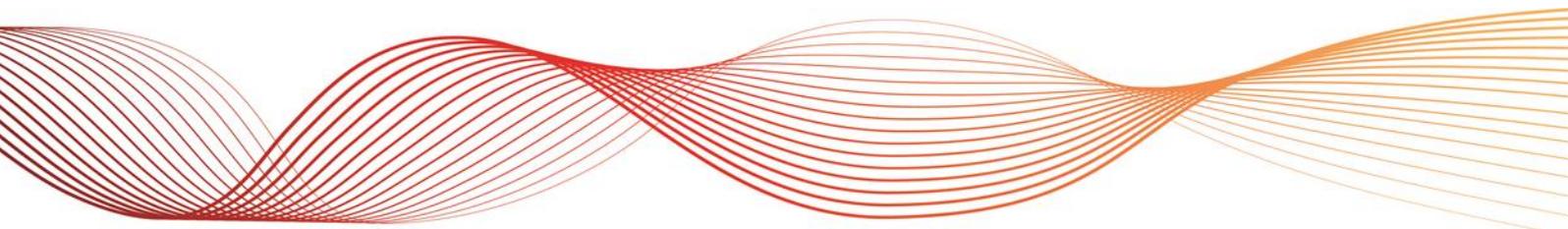




TRIP OF BANNABY - MARULAN 330 KV TRANSMISSION LINE ON 2 JULY 2015

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

Published October 2015





VERSION RELEASE HISTORY

VERSION	DATE	BY	CHANGES	CHECKED BY	AUTHORISED BY
1	7 October 2015	M Diesendorf	FINAL	S Darnell	J Lindley

INCIDENT CLASSIFICATIONS

Classification	Detail
Time and date of incident	0740 hrs Thursday 2 July 2015
Region of incident	NSW
Affected regions	NSW
Event type	Loss of multiple transmission elements (TT)
Primary cause	Protection and Control (PTN & CTR)
Generation Impact	No generator was disconnected or 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
B busbar	Bannaby 330 kV B Busbar
CB	Circuit Breaker
kV	Kilovolt
Line 36	Bannaby – Marulan 36 330 kV transmission line
MW	Megawatt
NER	National Electricity Rules



IMPORTANT NOTICE

Purpose

AEMO has prepared this document to provide information about this particular Power System Operating Incident.

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1. OVERVIEW

This report reviews a power system operating incident that occurred on Thursday 2 July 2015 in New South Wales. This incident involved:

- The trip and auto-reclose of the Bannaby–Marulan 330 kV transmission line (Line 36)
- The trip of Bannaby 330 kV B Busbar (B busbar)

The power system is operated such that it will remain in a satisfactory¹ operating state for the loss of single elements in the transmission network. Such events are defined as credible contingency² events. AEMO considers the occurrence of these events to be reasonably possible and ensures contingency plans are in place to minimise the impact on the power system following a credible contingency event. A non-credible contingency event is a contingency event other than a credible contingency event.

AEMO is required to assess power system security over the course of this incident as the incident is classified as a non-credible contingency under the National Electricity Rules (NER).³ Specifically, 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 security.⁴

AEMO concluded that:

- Line 36 and B busbar tripped because a faulty protection relay.
- Power system security was maintained over the course of the incident.

This report is based on information provided by TransGrid⁵ and AEMO. National Electricity Market time (Australian Eastern Standard Time) is used in this report.

2. THE INCIDENT

On Thursday 2 July 2015 between 0742 hrs and 0744 hrs, Line 36 tripped and reclosed, at the Bannaby end, three times before tripping a final time at 0745 hrs. At 0750 hrs Line 36 tripped at the Marulan end, and B busbar tripped.

No load or generation was lost as a result of this incident. B busbar was returned to service three hours after it tripped and Line 36 was returned to service eleven hours after it tripped.

See Appendix 1 for a power system diagram illustrating the incident and Appendix 2 for a chronological log of the incident.

The reason for investigating this incident is that Line 36 and a B busbar simultaneously tripped. The trip of Line 36 and B busbar is an unexpected event and is identified in power system security terms as a non-credible contingency.

¹ Refer to NER 4.2.2

² Refer to NER 4.2.3

³ Clause 4.8.15(a)(1)(i) and AEMC Reliability Panel Guidelines for Identifying Reviewable Operating Incidents.

⁴ NER Clause 4.8.15 (b)

⁵ TransGrid is the Transmission Network Service Provider in the New South Wales region.



3. TRANSGRID INVESTIGATION

TransGrid investigated this incident and found that a faulty protection relay on Line 36 at Bannaby caused the trip of Line 36 and B busbar. The analogue signal processing in the relay failed and caused the relay to generate spurious trip and auto reclosed signals.

The faulty relay was initially isolated which allowed B busbar to return to service later the same morning at 1029 hrs. The faulty relay was then replaced and Line 36 returned to service on the same day, with all protection in service, at 1906 hrs.

4. POWER SYSTEM SECURITY

This section assesses how power system security was managed over the course of the incident.⁶

Immediately following the incident AEMO invoked constraint set N-BYMN_ONE_15M. The constraint set is required when Line 36 is out of service, to ensure that the power system remained in a secure state.

TransGrid then identified and isolated the faulty protection relay and returned B busbar to service.

AEMO then assessed whether or not to reclassify the simultaneous trip of Line 36 and B busbar as a credible contingency.⁷ AEMO did not reclassify the incident because TransGrid had identified and isolated the faulty protection relay. AEMO thereby considered that the incident was unlikely to reoccur.

Later the same day, TransGrid replaced the faulty relay and returned Line 36 to service. AEMO then revoked constraint set N_BYMN_ONE_15M. This returned the power system in this area to its normal operating state.

Over the course of this incident power system security was maintained.

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 over the course of this incident.

AEMO generally informs the market of operational matters by issuing Market Notices. For this incident AEMO issued three market notices. Two notices informed the market of the incident as details emerged, and there third notified the market of AEMO's reclassification assessment.

Over the course this incident AEMO informed the market as required with appropriate and timely information.

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 AEMO is required to assess whether or not to reclassify a non-credible contingency event as a credible contingency - NER Clause 4.2.3A (c) - and to report how re-classification criteria were applied - NER Clause 4.8.15 (ca). AEMO has to determine if the condition that caused the non-credible contingency event has been resolved.



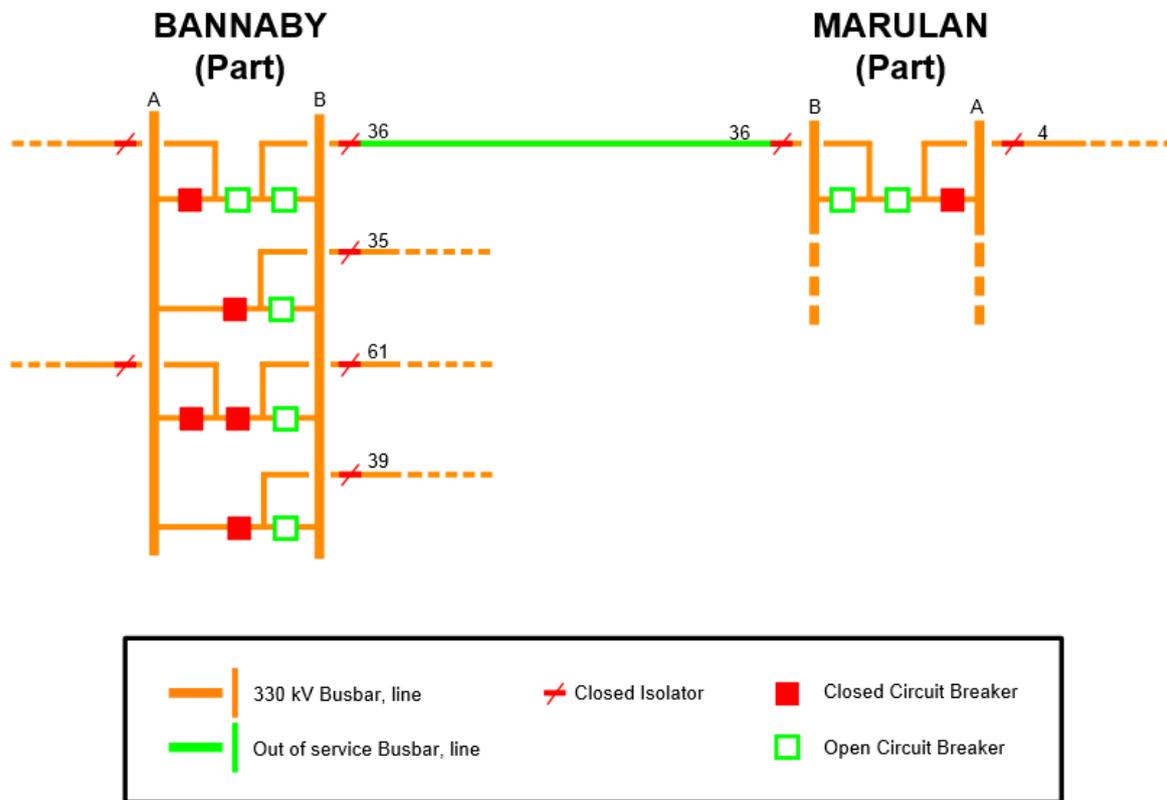
6. CONCLUSIONS

AEMO concluded that:

1. Line 36 and B busbar tripped due to a faulty line protection relay. The relay has since been replaced.
2. Power system security was maintained over the course of the incident.

APPENDIX A. POWER SYSTEM DIAGRAM

The power system immediately after the incident





APPENDIX B. INCIDENT EVENT LOG

Table 1 Incident Log

Time and Date	Event
0742 hrs 2 Jul 2015	Line 36 tripped at Bannaby – CBs 5012 & 362 both tripped and auto reclosed
0743 hrs	Line 36 tripped at Bannaby – CBs 5012 & 362 tripped, CB362 only auto reclosed
0744 hrs	Line 36 tripped at Bannaby - CB362 tripped and reclosed
0745 hrs	Line 36 tripped at Bannaby - CB362 tripped. Line 36 remained out of service
0750 hrs	Line 36 de-energised at the Marulan end - CBs 362 and 5002 tripped Bannaby 330 kV B Bus tripped – CBs 352B, 392B, 612 tripped
0755 hrs	AEMO invoked constraint set N-BYMN_ONE_15M
0802 hrs	AEMO issued Market Notice 49244: notification of non-credible contingency event (trip of Line 36)
0809 hrs	AEMO issued Market Notice 49245: notification of non-credible contingency event (trip of Bannaby 330 kV B Bus)
1029 hrs	TransGrid returned Bannaby 330 kV B Bus to service
1048 hrs	AEMO issued Market Notice 49247: notification that AEMO will not reclassify the incident as a credible contingency
1906 hrs	TransGrid returned Line 36 to service.
1915 hrs	AEMO revoked constraint set N-BYMN_ONE_15M