



Trip of Mullumbimby-Dunoon-Lismore 132 kV transmission lines on 11 Dec 2014

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

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1	3 March 2015	H Zhang	Initial	S Darnell	P Biddle

INCIDENT CLASSIFICATIONS

Time and date and of incident	1734 hrs Thursday 11 December 2014
Region of incident	New South Wales
Affected regions	New South Wales and Queensland
Event type	Loss of transmission elements and load interruption (TL)
Primary cause	Environment and Lightning (ENVI & LN)
Generation Impact	No Generation lost
Customer Load Impact	Approximately 3.6 MW of customer load lost
Associated reports	Nil

ABBREVIATIONS

Abbreviation	Term
AEMO	Australian Energy Market Operator
CB	Circuit Breaker
kV	Kilovolt
MW	Megawatt
NER	National Electricity Rules
9U6	One of two 132 kV transmission lines from Mullumbimby to Lismore via Dunoon
9U7	One of two 132 kV transmission lines from Mullumbimby to Lismore via Dunoon

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 11 December 2014 in New South Wales. The incident involved the trip of the Mullumbimby-Dunoon-Lismore 9U6 and 9U7 132 kV transmission lines. As a result Directlink was disconnected at the Mullumbimby end, and customer supply was lost at Dunoon. This incident was most likely caused by airborne debris as a result of storms in the area at the time.

AEMO is required to assess power system security over the course of this incident as the incident is classified as a multiple contingency event under the National Electricity Rules (NER).¹ 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.²

This report is based on information provided by Essential Energy³ and AEMO. National Electricity Market time (Australian Eastern Standard Time) is used in this report.

2. THE INCIDENT

On Thursday 11 December 2014 at 1734 hrs, 132 kV transmission line 9U6 tripped and auto-reclosed. At 1735 hrs, line 9U6 tripped again and then remained out of service. At 1740 hrs, 132 kV transmission line 9U7 tripped and remained out of service. As a result of both 9U6 and 9U7 lines being out of service Directlink tripped via a tripping scheme operation. The operation of the tripping scheme was an expected outcome.

Approximately 3.6 MW of customer load was lost at Dunoon as a result of this incident. 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 the two 132 kV transmission lines tripped which in turn tripped Directlink. The trip of multiple transmission lines at the same time is an unexpected event and is identified in power system security terms as a multiple contingency event.

3. ESSENTIAL ENERGY INVESTIGATION

Essential Energy investigated this incident and concluded that the incident was most likely caused by airborne debris during a storm. Essential Energy found that, although lightning was in the area at the time of the incident, no lightning strikes were recorded in the immediate vicinity of the lines 9U6 and 9U7.

Protection information identified phase-to-phase and phase-to-earth faults on both 9U6 and 9U7 lines at approximately 6 KM from Mullumbimby. The two circuits are on the same double circuit towers in this region. Essential Energy patrolled both lines but found no evidence of a fault.

At 22:59 hrs Essential Energy attempted to re-energise line 9U6. The attempt was unsuccessful but staff in the area heard and observed a flash. A piece of bark was then found hanging from the line. The bark was removed and lines 9U6 and 9U7 were returned to service at 00:55 hrs on 12 Dec 2014.

As a result of the line outages, approximately 3.6 MW of customer load was lost at Dunoon. The load was restored by 0045 hrs on the 12 December 2014.

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

² NER Clause 4.8.15 (b).

³ Essential Energy is a Network Service Provider in the NSW region.

3.1 Directlink

As a result of 9U6 and 9U7 line outages, Directlink tripped due to the operation of the Essential Energy- Directlink control tripping scheme⁴. This was an expected outcome as the AC connection to Mullumbimby was lost.

Directlink was returned to service 0750 hrs on Friday 12 December 2014.

4. POWER SYSTEM SECURITY

This section assesses how power system security was managed over the course of the incident.⁵

1. AEMO invoked constraint set N-LSDU_9U6⁶ at 1740 hrs approximately 5 minutes after the second trip of 9U6, and constraint set N-X_MBTE_3⁷ at 1750 hrs approximately 10 minutes after the trip of Directlink. These actions ensured that the power system returned to and remained in a secure operating state.⁸
2. AEMO issued Market Notice 47234 at 1822 hrs on 11 Dec 2014 approximately 42 minutes after 9U7 tripped to notify the market the multiple contingency event.
3. At 0735 hrs on 12 Dec 2014, the first pole of Directlink was returned to service. Five minutes later, at 0740 hrs, constraint set N-X_MBTE_3 was revoked and constraint set N-X_MBTE_2⁹ was invoked. Seven minutes later, at 0747 hrs, the second pole of Directlink was returned to service and constraint set N-X_MBTE_2 was revoked. All of the constraint sets were revoked by 0750 hrs on Friday 12 December 2014.
4. AEMO did not reclassify the incident as a credible event because the likely cause of the incident had been identified and line protection and control schemes had operated correctly. AEMO thereby considered that the event was unlikely to reoccur.

For this incident the power system remained secure over the course of the incident.

5. CONCLUSIONS

AEMO concluded that:

1. The trip of lines 9U6 and 9U7 was likely due to storm debris. Directlink correctly tripped in response to these outages.
2. The provision and response of facilities and services were appropriate and power system security was maintained over the course of the incident.
3. There are no outstanding issues to resolve as a result of this incident.

⁴ Essential Energy - Directlink tripping scheme: At Mullumbimby, an interlock prevents Directlink operating if the 132kV circuit breakers on lines 9U6 and 9U7 are open.

⁵ 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.

⁶ N-LSDU_9U6: Constraint set for one of Lismore to Dunoon 132kV lines (9U6 or 9U7) out of service.

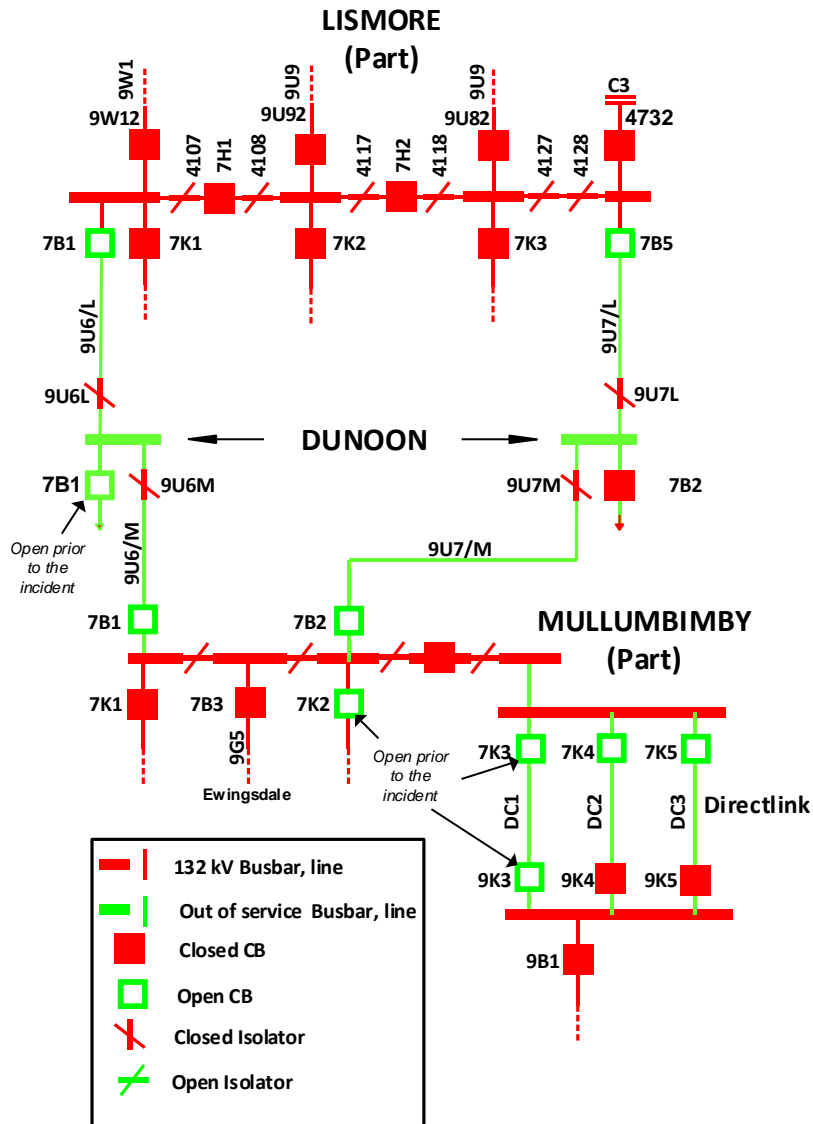
⁷ N-X_MBTE_3: Constraint set for all three Directlink cables out of service.

⁸ AEMO is required to return the power system to a secure state within thirty minutes following a contingency event - NER Clause 4.2.6 (b).

⁹ N-X_MBTE_2: Constraint set for two Directlink cables out of service.

APPENDIX 1 – POWER SYSTEM DIAGRAM

The power system after the trip of lines 9U6 and 9U7



APPENDIX 2 – INCIDENT EVENT LOG

Incident Log

Time and Date	Event
1734 hrs 11 Dec 2014	Mullumbimby –Dunoon – Lismore 132 kV line 9U6 tripped and reclosed.
1735 hrs 11 Dec 2014	Mullumbimby –Dunoon – Lismore 132 kV line 9U6 tripped again and remained out of service.
1740 hrs 11 Dec 2014	Mullumbimby –Dunoon – Lismore 132 kV line 9U7 tripped and remained out of service.
1740 hrs 11 Dec 2014	3.6 MW of customer load lost at Dunoon.
1740 hrs 11 Dec 2014	Directlink, DC pole 2 and DC pole 3 tripped due to Essential Energy control scheme action. ¹⁰
1740 hrs 11 Dec 2014	Constraint N-LSDU_9U6 invoked.
1750 hrs 11 Dec 2014	Constraint N-X_MBTE_3 invoked.
1811 hrs 11 Dec 2014	Essential energy advised the both lines will be patrolled.
1812 hrs 11 Dec 2014	APA advised that investigations are being carried out on DC pole 2 and pole 3.
1822 hrs 11 Dec 2014	Market notice 47234 issued.
0046 hrs 12 Dec 2014	All customer load restored at Dunoon.
0100 hrs 12 Dec 2014	Mullumbimby –Dunoon – Lismore 9U6 and 9U7 132 kV Lines returned to service.
0110 hrs 12 Dec 2014	Constraint N-LSDU_9U6 revoked.
0735 hrs 12 Dec 2014	Directlink DC pole 2 restored to service.
0740 hrs 12 Dec 2014	Constraint N-X_MBTE_2 invoked and Constraint N-X_MBTE_3 revoked.
0747 hrs 12 Dec 2014	Directlink DC pole 3 restored to service.
0750 hrs 12 Dec 2014	Constraint N-X_MBTE_2 revoked.

¹⁰ Pole 1 was out of service prior to the event and remained out of service.