

# 110 kV BUSBAR TRIP AT MUDGEERABA SUBSTATION ON 29 MARCH 2017

REVIEWABLE OPERATING INCIDENT REPORT UNDER THE  
NATIONAL ELECTRICITY RULES

Published: **12 July 2017**





# INCIDENT CLASSIFICATIONS

| Classification            | Detail  |
|---------------------------|---|
| Time and date of incident | 0840 hrs Wednesday 29 March 2017                                      |
| Region of incident        | Queensland  |
| Affected regions          | Queensland and New South Wales  |
| Event type                | Busbar trip   |
| Generation Impact         | 22 MW of generation from Condong Sugar Mill disconnected              |
| Customer Load Impact      | 58 MW of load supplied from Terranora Substation in NSW disconnected. |
| 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

AEMO has made every effort to ensure the quality of the information in this report but cannot guarantee its accuracy or completeness. Any views expressed in this report are those of AEMO unless otherwise stated, and may be based on information given to AEMO by other persons.

Accordingly, to the maximum extent permitted by law, AEMO and its officers, employees and consultants involved in the preparation of this report:

- make no representation or warranty, express or implied, as to the currency, accuracy, reliability or completeness of the information in this report; and
- are not liable (whether by reason of negligence or otherwise) for any statements or representations in this report, or any omissions from it, or for any use or reliance on the information in it.

### Copyright

© 2017. Australian Energy Market Operator Limited. The material in this publication may be used in accordance with the [copyright permissions on AEMO's website](#).



# 1. OVERVIEW

This report relates to a reviewable operating incident<sup>1</sup> that occurred at 0840 hrs on Wednesday 29 March 2017, where the Mudgeeraba No. 2 and No. 4 110 kilovolt (kV) busbars tripped out of service. As a result of the incident, the Mudgeeraba – Terranora 758 110 kV line (758 line) was disconnected, interrupting supply to Terranora Substation in New South Wales and offloading Directlink.

Interruption of supply to Terranora Substation resulted in the loss of 58 megawatts (MW) of customer load and 22 MW of generation.

As this was 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.<sup>2</sup>

AEMO has concluded that:

1. The trip of the Mudgeeraba 2-4 110 kV busbars was due to the operation of the busbar ‘Y’ protection system during planned project work being undertaken by Powerlink.
2. The Power System was maintained in a secure operating state during the incident.
3. The market was adequately informed of the incident within the required time periods.
4. 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.

The Mudgeeraba No. 2 and No. 4 110 kV busbars were reenergised at 0853 hrs on the day of the event, supply was returned to Terranora substation at 0915 hrs, and all load was restored by 0930 hrs.

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 and Powerlink.<sup>3</sup>

Australian Eastern Standard Time (AEST) is used in this report.

---

<sup>1</sup> See NER clause 4.8.15.

<sup>2</sup> See NER clause 4.8.15(b).

<sup>3</sup> Information provided by Powerlink 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 Powerlink (or its respective associated companies, businesses, partners, directors, officers or employees).



## 2. THE INCIDENT

At 0840 hrs on Wednesday 29 March 2017, the Mudgeeraba No. 2 and No. 4 110 kV busbar tripped, disconnecting the 758 line. At the time of the incident, the Mudgeeraba – Terranora 757 110 kV line (757 line) was on a planned outage and all other in-service elements at Mudgeeraba substation were supplied by the Mudgeeraba No. 1 and No. 3 110 kV busbar.

The 757 line and 758 line form the Terranora interconnector, connecting Mudgeeraba substation in Queensland to Terranora substation in New South Wales. Terranora is connected to the rest of the New South Wales electricity network via the Directlink DC link.

As a result of the disconnection of the 758 line, supply to Terranora substation was interrupted. This resulted in the loss of 58 MW of customer load supplied from Terranora Substation, 22 MW of generation from the Condong Sugar Mill<sup>4</sup>, and the offloading of Directlink.

See Appendix A for a diagram of the relevant parts of the power system prior to and immediately after the incident, and Appendix B for a chronological log of the incident.

The Mudgeeraba No. 2 and No. 4 110 kV busbar was reenergised at 0853 hrs on 29 March, and the 758 line was restored at 0915 hrs, returning supply to Terranora Substation. All load at Terranora Substation was restored by 0930 hrs. Directlink was returned to service at 1017 hrs.

The reason for investigating this incident is that trip of a busbar is considered a non-credible contingency.

## 3. PARTICIPANT INVESTIGATION

This section is based on information provided by Powerlink.

The Mudgeeraba No. 2 and No. 4 110 kV busbar tripped as a result of the operation of the busbar ‘Y’ protection system during the transfer of secondary circuits from the existing busbar protection scheme to a new protection scheme. Operation of the busbar protection initiates trip signals to all circuit breakers connected to the busbar.

There was no fault on the busbar, and the busbar protection system was not expected to operate given the work that was being performed at the time of the incident. The Mudgeeraba No. 2 and No. 4 110 kV busbar was returned to service at 0853 hrs on 29 March. The 758 line was reenergised from Mudgeeraba at 0856 hrs and supply restored to Terranora at 0915 hrs on 29 March.

In response to this incident, Powerlink implemented additional precautions to prevent any further unexpected operation of the busbar protection while the protection upgrade work continued. The protection upgrade was completed on 31 March 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 take all reasonable actions to return the power system to a secure state following a contingency event

---

<sup>4</sup> The Condong Sugar Mill generation is embedded in Terranora distribution network.

in accordance with the NER.<sup>5</sup> This section assesses how AEMO managed power system security over the course of this incident.

AEMO invoked constraints I-TE\_ZERO<sup>6</sup> and N-X\_MBTE\_3<sup>7</sup> at 0850 hrs, ten minutes after the incident. These actions were carried out in a timely manner which ensured that the power system was restored to, and maintained in, a secure operating state.

Constraint I-TE\_ZERO was revoked at 0915 hrs after restoration of supply to Terranora Substation.

The two available legs (leg 1 and leg 3) of Directlink were returned to service between 1017 hrs and 1103 hrs and the associated constraints revoked. No further actions were required to maintain power system security.

## 4.1 Reclassifications

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. This non-credible contingency event was caused by the inadvertent initiation of the busbar protection system. Powerlink informed AEMO that the incident was not likely to reoccur and that additional precautions had been implemented. AEMO therefore did not reclassify the event as a credible contingency.

For this incident, AEMO took appropriate action to ensure that the power system was returned to, and maintained in, a secure operating state.

# 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 on the following matters:

- The occurrence of a non-credible contingency event – notify within two hours of the event.<sup>8</sup>
  - AEMO issued Market Notice 58285 at 0914 hours – 34 minutes after the event
- Constraints invoked with interconnector terms on the left hand side (LHS).<sup>9</sup> 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 LHS.
  - AEMO issued Market Notice 58284 at 0857 hrs to advise the market that constraint set I-TE\_ZERO had been invoked, which contained the N-Q-MNSP1 interconnector on the LHS.

No other notifications were required.

<sup>5</sup> 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.

<sup>6</sup> Terranora interconnector transfer limit is zero.

<sup>7</sup> Out = All 3 Directlink legs.

<sup>8</sup> 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. Available at: [https://www.aemo.com.au/-/media/Files/Electricity/NEM/Security\\_and\\_Reliability/Power\\_System\\_Ops/Procedures/SO\\_OP\\_3715---Power-System-Security-Guidelines.pdf](https://www.aemo.com.au/-/media/Files/Electricity/NEM/Security_and_Reliability/Power_System_Ops/Procedures/SO_OP_3715---Power-System-Security-Guidelines.pdf).

<sup>9</sup> For short term outage AEMO is required to notify the Market of variances to interconnector transfer limits. AEMO, *Power System Security Guidelines*, Section 22.



## 6. CONCLUSIONS

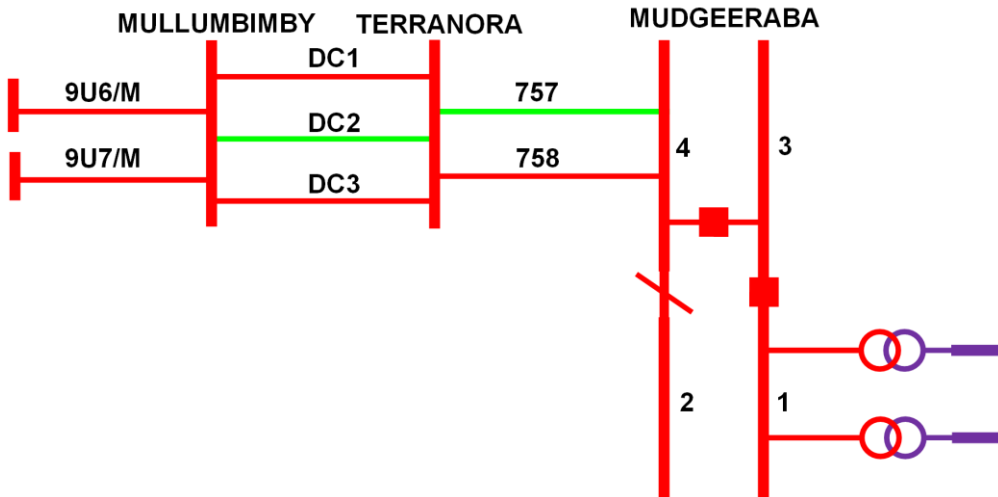
AEMO has assessed this incident in accordance with clause 4.8.15(b) of the NER. In particular, AEMO has assessed the adequacy of the provision and response of facilities or services and, the appropriateness of actions taken to restore or maintain power system security.

AEMO has concluded that:

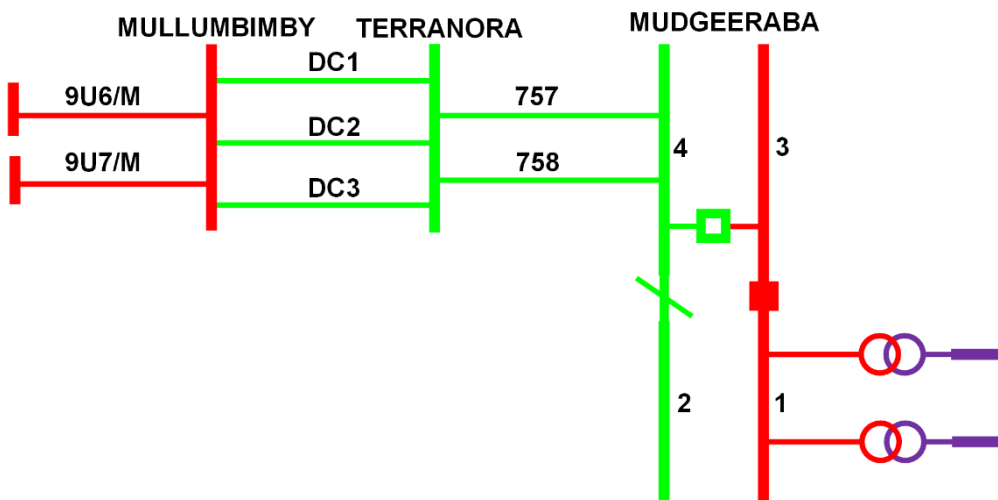
1. The trip of the Mudgeeraba No. 2 and No. 4 110 kV busbars was due to the operation of the busbar 'Y' protection system during planned project work being undertaken by Powerlink.
2. The power system was maintained in a secure operating state during the incident.
3. The market was adequately informed of the incident within the required time periods.
4. 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

System configuration before the incident. Elements not related to this incident have been omitted for clarity.



System configuration immediately after the incident. Elements not related to this incident have been omitted for clarity.





## APPENDIX B. – INCIDENT EVENT LOG

### Chronological log of incident

| Time and date     | Event  |
|-------------------|--|
| 29 March 0840 hrs | Mudgeeraba bus No. 2 and No. 4 trip, 758 line trip. Interruption of supply to Terranora, and Directlink disconnected |
| 0850 hrs          | Constraint sets I-TE_ZERO and N-X_MBTE_3 invoked   |
| 0857 hrs          | MN 58284 issued advising – Inter-regional transfer limit variation – Terranora Interconnector                        |
| 0914 hrs          | MN 58285 issued advising – Non-credible contingency event – Mudgeeraba No. 2 and No. 4 110 kV bus trip               |
| 0915 hrs          | Mudgeeraba – Terranora 758 Line restored<br>Constraint set I-TE_ZERO revoked   |
| 0930 hrs          | All load restored  |
| 0935 hrs          | MN 58286 issued advising – Update Inter-regional transfer limit variation – Terranora Interconnector                 |
| 0959 hrs          | MN 58287 issued advising – Update Non-credible contingency event   |
| 1017 hrs          | Directlink cable 1 returned to service   |
| 1025 hrs          | Constraint set N-X_MBTE_3 revoked and N-X_MBTE_2 <sup>10</sup> invoked   |
| 1037 hrs          | MN 58289 issued advising – Update Inter-regional transfer limit variation – Terranora Interconnector                 |
| 1103 hrs          | Directlink cable 3 returned to service   |
| 1110 hrs          | Constraint set N-X_MBTE_2 revoked  |

<sup>10</sup> Out = 2 Directlink legs.