

# POWER SYSTEM OPERATING INCIDENT REPORT: TRIP OF 837 TARONG – MT. ENGLAND 275 KV LINE AND MT. ENGLAND NO.1 275 KV BUSBAR ON 30 OCTOBER 2011

PREPARED BY: Electricity System Operations Planning and Performance

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FINAL

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## Abbreviations and Symbols

Abbreviation	Term
CB	CB
CT	Current Transformer
kV	Kilovolt

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## 1 Introduction

At 2134 hrs on 30 October 2011, the No. 1 275 kV busbar at Mt. England in Queensland tripped. A sequence of events took place in the transmission network over a two second period when lightning activity was present in the area. The lightning activity caused high voltage faults on the 837 Tarong – Mt. England 275 kV line and its 275 kV current transformer (CT) at Mt. England substation, resulting in the trip of the No. 1 275 kV busbar at Mt. England.

At 1023 hrs on 31 October 2011, the Mt. England No.1 275 kV busbar and all the affected network elements were returned to service. There was no loss of load as a result of this incident.

This report has been prepared under clause 4.8.15 of the National Electricity Rules (NER) 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.

This report is largely based upon information provided by Powerlink. Data from AEMO's Energy Management System have also been used in analysing the incident.

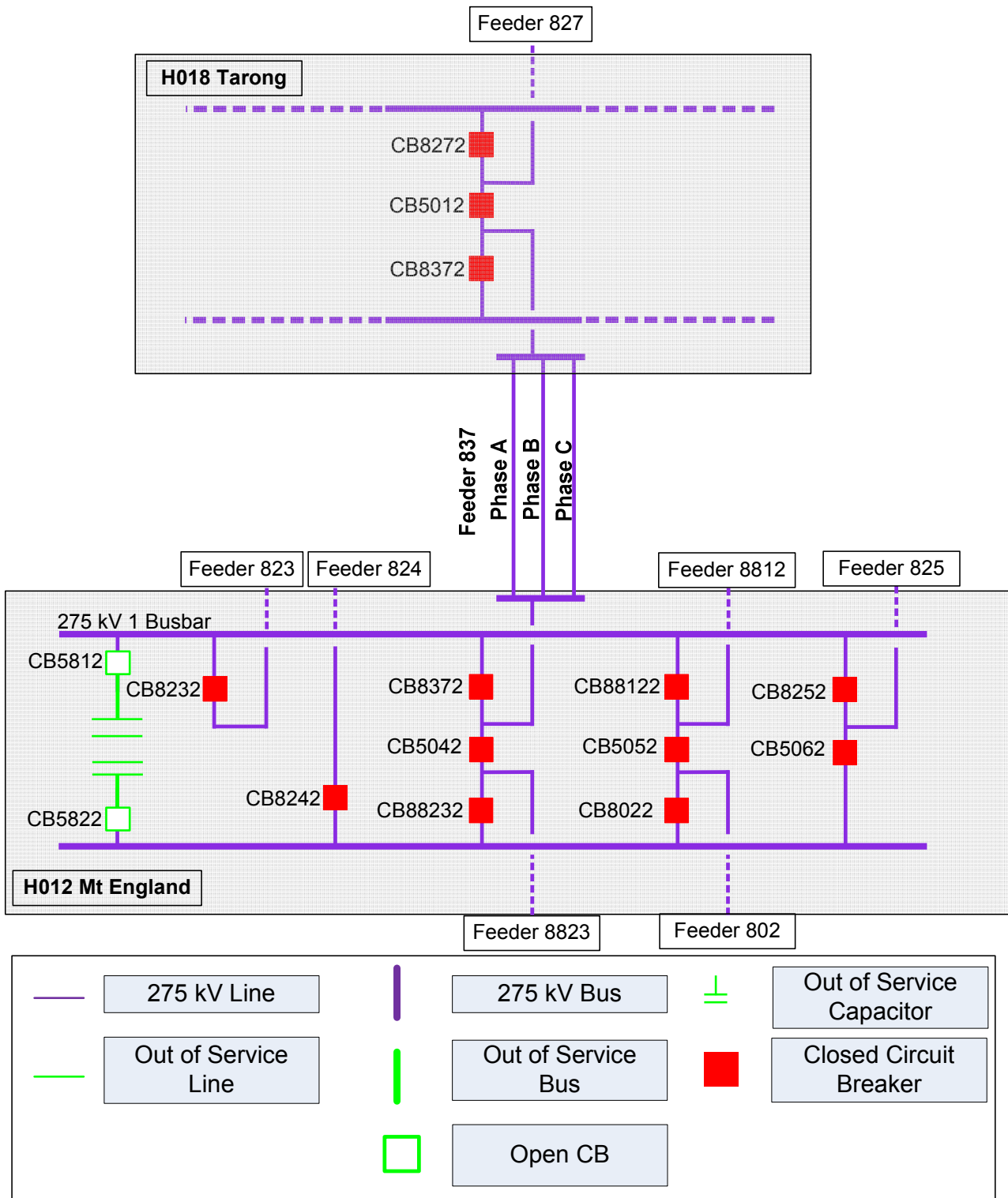
All references to time in this report refer National Electricity Market time (Eastern Standard Time).

## 2 Pre-Contingent System Conditions

Prior to the incident, all circuit breakers (CB) and transmission elements connecting to Tarong and Mt. England substations were in service with the exception of capacitors, which were switched off for voltage control.

The status of the power system prior to the incident is shown in Figure 1. For clarity, only equipment relevant to this incident has been included in the diagram.

Figure 1 – Status of the power system prior to the incident



### 3 Summary of Events

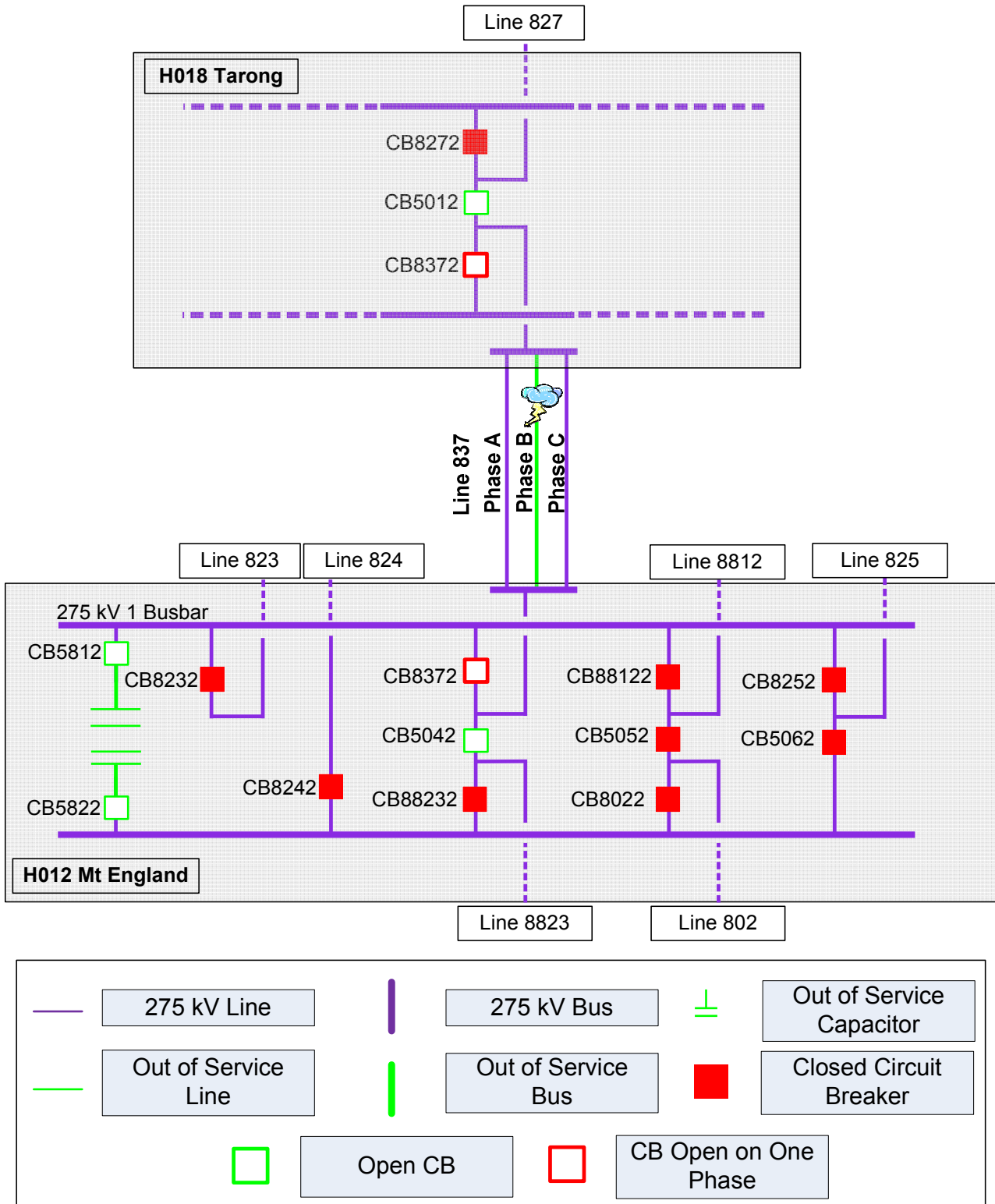
At 21:34:58 on 30 October 2011, a one phase to ground fault occurred on the B phase of the 837 Tarong – Mt. England 275 kV line during lightning activity in the area. Protection systems operated to trip the faulted phase at Tarong and Mt. England substations.

The detailed information acquired by Powerlink showed evidence that a lightning strike caused the one phase to ground fault. Initially, the following CBs operated and cleared the fault from the power system:

- H018 Tarong CB 8372 B phase only
- H018 Tarong CB 5012
- H012 Mt. England CB 8372 B phase only
- H012 Mt. England CB 5042

Figure 2 shows the status of the relevant CBs immediately following the incident.

Figure 2 - Status of the power system after the one phase to ground trip of 837 Tarong – Mt. England 275 kV line



## **TRIP OF NO. 1 275KV BUSBAR AT MT. ENGLAND**

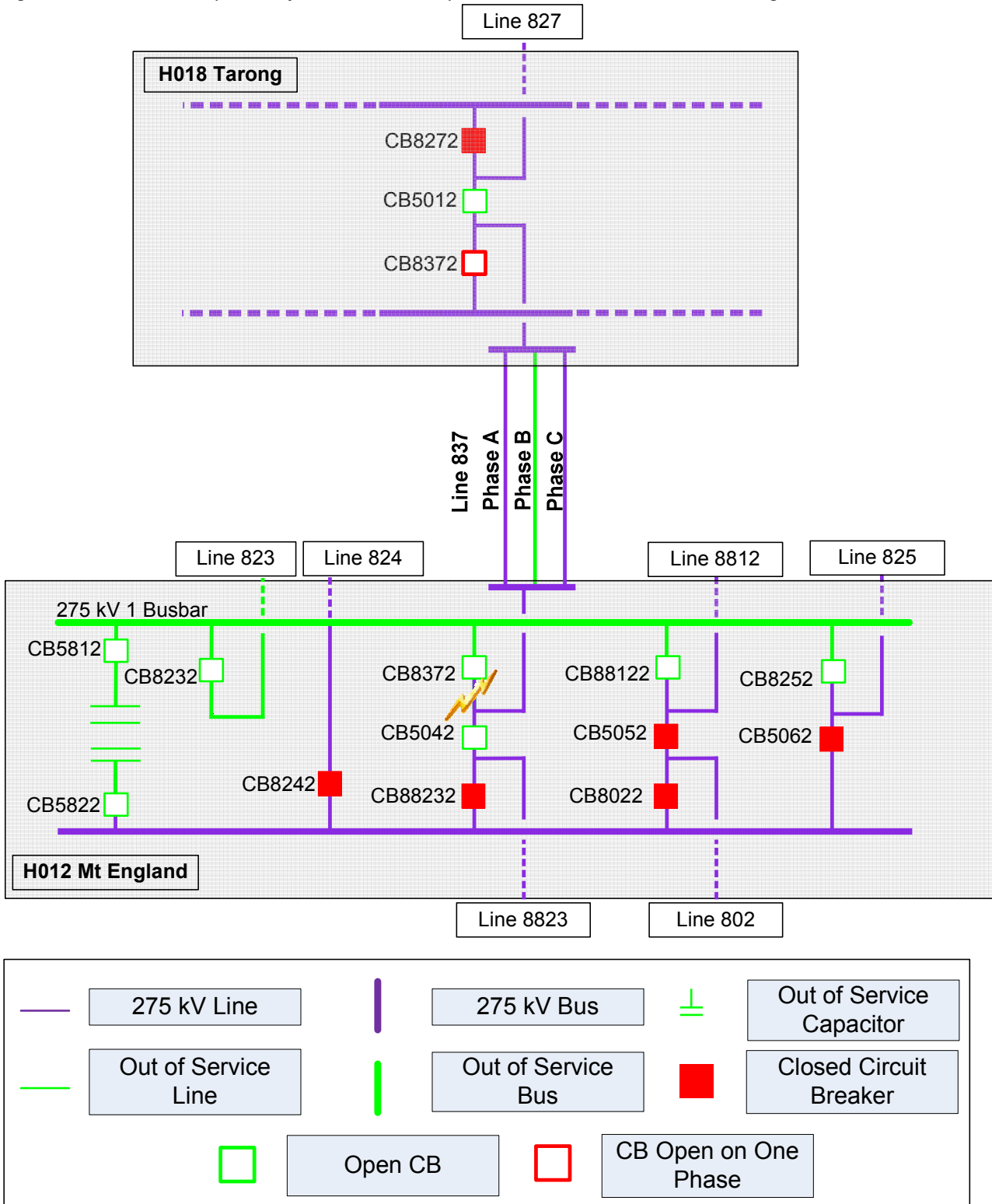
Approximately 500 milliseconds after the initial fault on the B phase of 837 line, and during the time 837 line B phase was open, an insulation flashover occurred internal to the B phase of 275 kV CT associated with CB 8372 at Mt. England substation and within the zone protected by the No.1 275 kV busbar protection systems. The insulation flashover was most likely due to lightning activity in the vicinity of the 837 line. The faulted CT triggered the operation of the Mt. England No.1 275 kV busbar protection systems.

As a result of the busbar protection system operation, the Mt. England No.1 275 kV busbar was de-energised with the following CBs at Mt. England opening:

- 275 kV CB 8372 A and C phases, which off-loaded the 837 Tarong – Mt. England 275 kV line (B phase was already open)
- 275 kV CB 8232, which de-energised the 823 Mt. England – Wivenhoe / Wivenhoe Unit 1 275kV line. Wivenhoe Unit 1 was not in service at the time of the event.
- 275 kV CB 8252.
- 275 kV CB 88122.

Figure 3 shows the status of the CBs after the trip of No. 1 275 KV busbar at Mt. England.

Figure 3 - Status of the power system after the trip of No. 1 275 kV Busbar at Mt. England



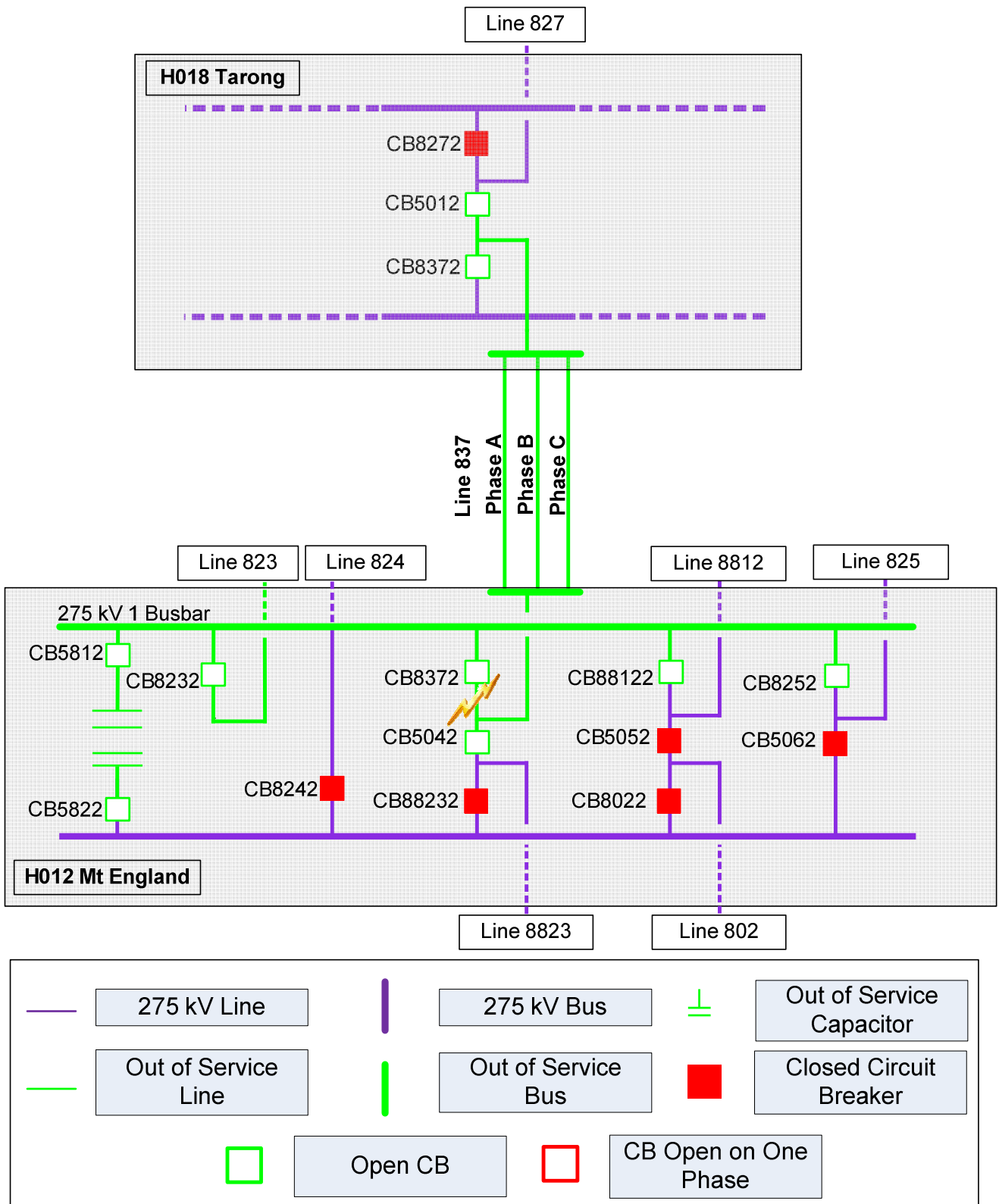


### **FEEDER 837 AUTO-RECLOSE AT TARONG**

At 21:34:59, the 837 line autoreclose function at Tarong operated to re-energise B phase of the 837 line from Tarong substation. The high voltage fault was still present due to the insulation flashover internal to the 275 kV CT associated with CB 8372 at Mt. England substation. This caused the protection systems of the 837 line at Tarong to operate, resulting in the trip and lockout of CB 8372 at Tarong and, consequently, de-energisation of the 837 line

Figure 4 shows the status of the CBs after the de-energisation of the 837 line.

Figure 4 - Status of the power system after trip of 837 Tarong – Mt. England 275 kV line



## 4 Immediate Actions Taken

Date	Time	Operation
30-Oct-11	2140 hrs	AEMO invoked the constraint sets associated with the outage of 837 Tarong – Mt. England 275 kV line (Q-TRME)
	2145 hrs	AEMO invoked the constraint sets associated with the outage of 823 Mt. England – Wivenhoe 275 kV line (Q-ME WV-823)
	2158 hrs	Market Notice 36471 was issued to inform participants of inter-regional transfer limitations due to the constraints invoked. The constraints did not bind.
31-Oct-11	0039 hrs	No. 1 275 kV busbar at Mt. England was returned to service; 825 Tarong – Mt. England 275 kV line was reconnected to Mt. England No.1 275 kV busbar.
	0040 hrs	8812 Tarong – Mt. England 275 kV line was reconnected to Mt. England 275 kV 1 Busbar.
	0059 hrs	Market Notice 36472 was issued to advise participants of a non-credible contingency event and that AEMO did not reclassify this event as a credible contingency event. 823 Mt. England – Wivenhoe 275 kV line was returned to service.
	0110 hrs	Constraint set (Q-ME WV-823) was revoked.
	10:23-10:26 hrs	837 Tarong – Mt. England 275 kV line was returned to service via No. 2 275 kV busbar at Mt. England by closing H012 Mt. England CB 5042 and H018 Tarong CB 5012 and CB 8372.
	1030 hrs	Constraint set (Q-TRME) was revoked.

In accordance with its operating procedure SO\_OP 3715 Power System Security Guidelines<sup>1</sup>, AEMO determined that it was not appropriate to reclassify the loss of 837 Tarong – Mt. England 275 kV line and No.1 275 KV busbar at Mt. England as a credible contingency because the high voltage equipment associated with the failed Mt. England No.1 275 KV busbar remained out of service for repairs.

## 5 Follow-up Actions

Powerlink identified and replaced the faulty 275 kV CT equipment associated with CB 8372 at Mt. England substation. The 837 Tarong – Mt. England 275 kV line was reconnected to No.1 275 kV busbar at Mt. England and re-energised at 1632 hrs on 2 November 2011.

## 6 Power System Security Assessment

There was no loss of load or generation as a result of this event.

The power system voltages and frequencies remained within the normal operating bands and the power system remained in a secure operating state throughout the incident.

AEMO followed its procedures and determined that it was not appropriate to reclassify the loss of 837 Tarong – Mt. England 275 kV line and No.1 275 KV busbar at Mt. England as a credible contingency based on the information Powerlink provided to AEMO.

<sup>1</sup> Clause 4.2.3B of the NER requires that AEMO establish criteria to use when considering whether a non-credible contingency event is reasonably possible. This is published in AEMO operating procedure SO\_OP 3715 Power System Security Guidelines, which is available at:

<http://www.aemo.com.au/electricityops/3715.html>

## **7 Conclusions**

At 2134 hrs on 30 October 2011, a sequence of transmission system network events occurred over a two second period as a result of separate one phase to ground faults occurring on 275 kV Feeder 837 Tarong – Mt. England conductors during a storm. Consequently, Mt. England No.1 275 kV busbar tripped due to a flashover, which occurred at a location internal to the CT and within the zone protected by the No.1 275 kV busbar protection systems.

The faults were cleared from the power system and Powerlink replaced the affected network elements at Mt. England substation.

AEMO is satisfied that Powerlink has carried out the appropriate work to minimise the risk of a similar incident occurring in the future.

AEMO correctly applied the criteria published in section 12 of its Power System Security Guidelines in assessing that the circumstances of this incident did not warrant reclassifying similar incidents as a credible contingency event.

## **8 Recommendations**

There are no recommendations arising from this incident.