

Power System Operating Incident Report – Trip of Ross 275 kV No. 2 Busbar on 14 November 2013

PREPARED BY: AEMO Systems Capability

DATE: 10 January 2014

STATUS: FINAL

Contents

1	Introduction	4
2	The Incident	4
3	TNSP Investigation	4
4	System Diagrams.....	4
5	Incident Event Log.....	6
6	Immediate Actions	6
7	Follow-up Actions.....	6
8	Power System Security.....	7
9	Conclusions	7
10	Recommendations	7

Disclaimer

Purpose

This report has been prepared by the Australian Energy Market Operator Limited (**AEMO**) for the sole purpose of meeting obligations in accordance with clause 4.8.15 (c) of the National Electricity Rules (NER).

No reliance or warranty

This report contains data provided by third parties and might contain conclusions or forecasts and the like that rely on that data. This data might not be free from errors or omissions. While AEMO has used due care and skill, AEMO does not warrant or represent that the data, conclusions, forecasts or other information in this report are accurate, reliable, complete or current or that they are suitable for particular purposes. You should verify and check the accuracy, completeness, reliability and suitability of this report for any use to which you intend to put it, and seek independent expert advice before using it, or any information contained in it.

Limitation of liability

To the extent permitted by law, AEMO and its advisers, consultants and other contributors to this report (or their respective associated companies, businesses, partners, directors, officers or employees) shall not be liable for any errors, omissions, defects or misrepresentations in the information contained in this report, or for any loss or damage suffered by persons who use or rely on such information (including by reason of negligence, negligent misstatement or otherwise). If any law prohibits the exclusion of such liability, AEMO's liability is limited, at AEMO's option, to the re-supply of the information, provided that this limitation is permitted by law and is fair and reasonable.

© 2013 Australian Energy Market Operator Ltd. All rights reserved

Version Release History

VERSION	DATE	BY	CHANGES	CHECKED BY	AUTHORISED BY
1	10 Jan 2014	S Darnell	FINAL	P Biddle	P Biddle

Incident Classifications

Time and date and of incident	1523 hrs Thursday 14 November 2013
Region of incident	Queensland
Affected regions	Queensland
Event type	BB – Busbar Trip
Primary cause	TE – Transmission Equipment Failure
Impact	Nil – No loss of Load or Generation
Associated reports	Nil

Abbreviations and Symbols

Abbreviation	Term
AEMO	Australian Energy Market Operator
CB	Circuit Breaker
CT	Current Transformer
EMMS	Electricity Market Management System
EMS	Energy Management System
kV	Kilovolt
NER	National Electricity Rules

1 Introduction

This report reviews a power system operating incident that occurred on 14 November 2013 in Queensland at Powerlink's Ross Substation. AEMO is required to review this incident as it is classified as a non-credible contingency that satisfies the requirements of a reviewable operating incident under the National Electricity Rules¹ (NER).

The purpose of this incident review is to assess power system security over the course of the incident. The NER requires AEMO 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 security².

This report is based upon information provided by Powerlink³. Data from AEMO's Energy Management System (EMS) and Electricity Market Management System (EMMS) has also been used in analysing the incident.

References to time in this report are to National Electricity Market time (Australian Eastern Standard Time).

2 The Incident

On Thursday 14 November 2013, at 1523 hrs, the No.2 275 kV Busbar at Ross Substation tripped. The cause of the event was a high voltage fault internal to a current transformer (CT) on the line side of a busbar circuit breaker (CB). The fault also tripped the SVC at Ross Substation and off-loaded a 275/132 kV transformer as a result of the busbar trip. The failed CT and its associated CB were then isolated, and the busbar, SVC and transformer were returned to service at 1630 hrs approximately one hour after the trip.

The primary determinant to for investigating this incident is that a transmission busbar tripped. The probability of a busbar fault is very low and is therefore an unexpected event known in power system security terms as a non-credible contingency.

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

3 TNSP Investigation

Powerlink investigated the incident and found that a high voltage fault internal to a 275 kV CT caused the busbar to trip. The busbar trip was an expected outcome for this kind of fault. Protection systems correctly tripped Ross No.2 275 kV busbar and Ross SVC. The fault was cleared from the power system within required clearance times⁴. Also, local transformer 2T 275/132 kV was off-loaded as a result of the busbar trip.

The failed CT and associated CB 5812 were then isolated, and the busbar, SVC and transformer were subsequently returned to service. The failed CT was later replaced and, together with CB 5812, was returned to service on 30 November 2013.

4 System Diagrams

The status of the power system before the incident is shown in Figure 1 and after the incident in Figure 2. For clarity only equipment relevant to this incident has been included in the diagrams. Figure 1 show Ross No.2 275 kV Busbar, Ross SVC and 2T 275/132 kV transformer in service, and Figure 2 shows the same plant out of service or off-loaded.

¹ NER v60 Clause 4.8.15(a)(1)(i) and AEMC Reliability Panel Guidelines for Identifying Reviewable Operating Incidents.

² NER v60 Clause 4.8.15 (b)

³ Powerlink is the Transmission Network Service Provider in Queensland

⁴NER v60 S5.1a.8

Figure 1 – Power system at Ross 275 kV Substation before the incident

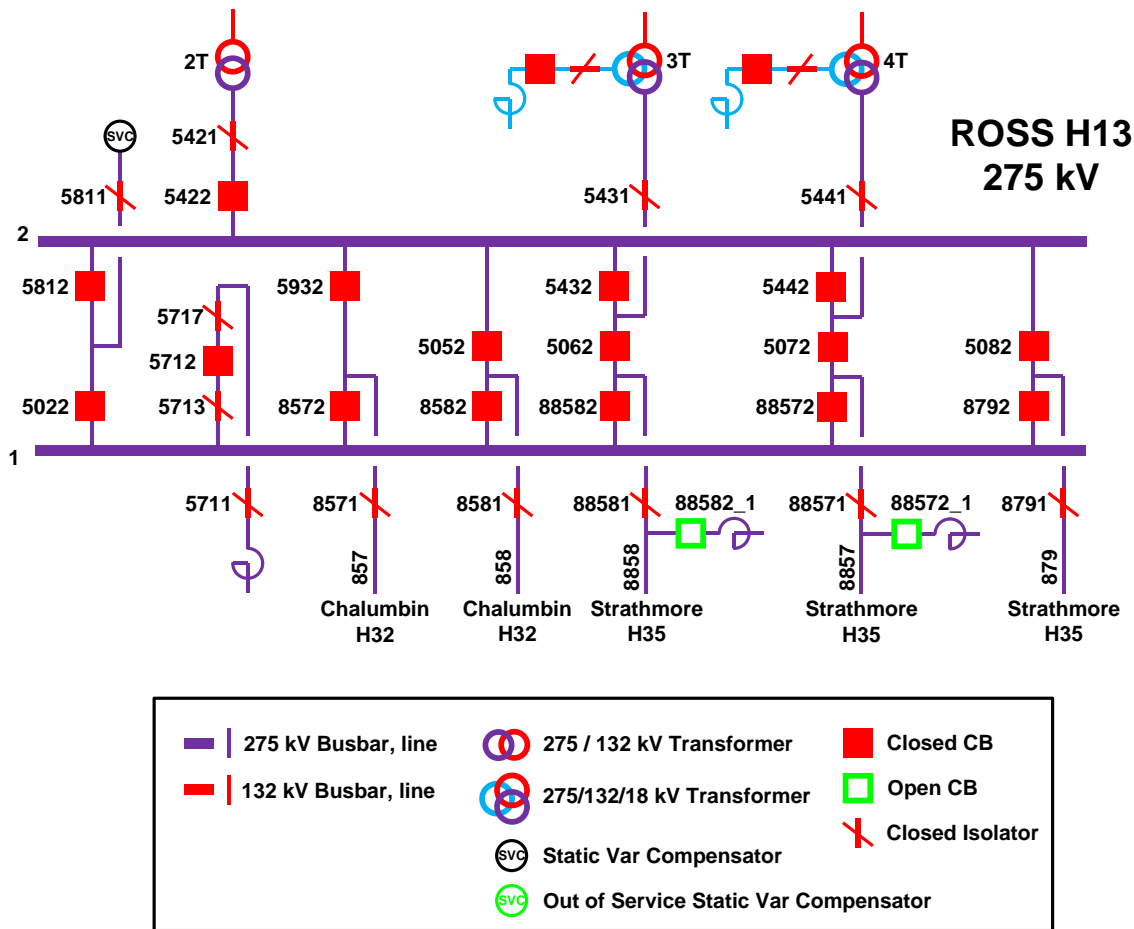
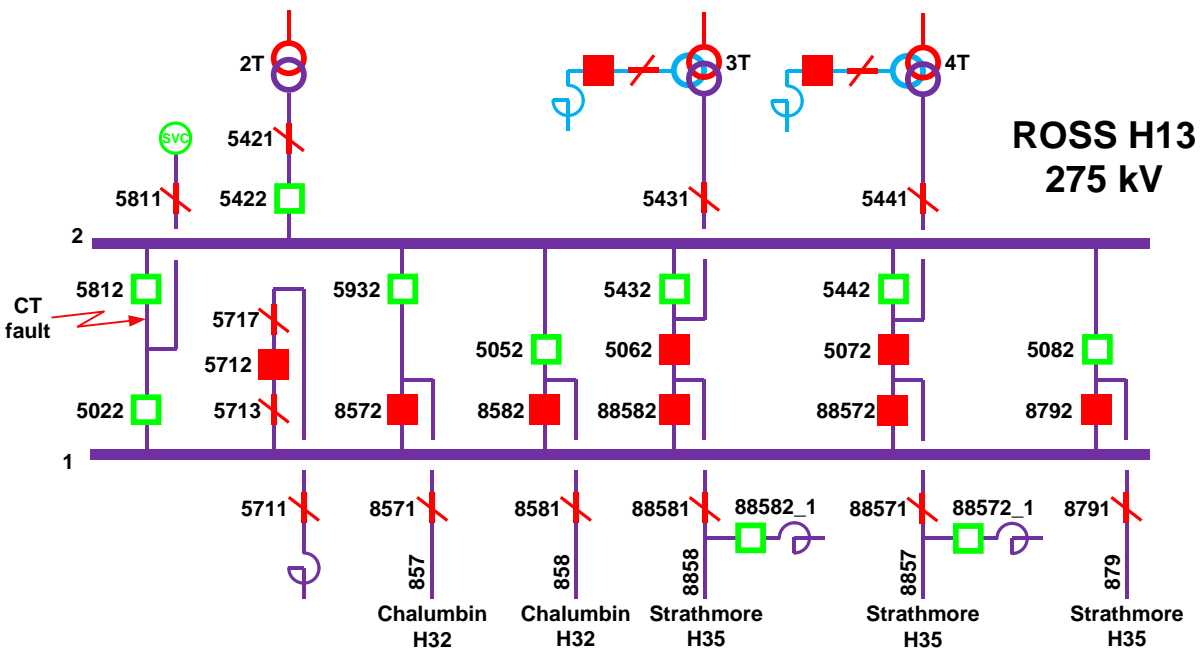


Figure 2 – Power system at Ross 275 kV Substation after the incident



5 Incident Event Log

The sequence of events comprising the incident are itemised in Table 1. The incident spanned approximately one hour from the busbar trip to the busbar being returned to service.

Table 1 – Event Log

Date and Time	Event
1532 hrs 14 Nov 2013	Ross No.2 275 kV Busbar and Ross SVC tripped 2T 275/132 kV transformer was off-loaded
1535 hrs 14 Nov 2013	Constraint Set Q-H13RS_SVC invoked
1544 hrs 14 Nov 2013	Market Notice 43846 issued to notify the market of a non-credible contingency event
1630 hrs 14 Nov 2013	Ross No. 2 275 kV Busbar, Ross SVC, and 2T Transformer returned to service
1649 hrs 14 Nov 2013	Market Notice 43848 issued to notify the market that: <ul style="list-style-type: none"> • the cause of the non-credible contingency had been identified • AEMO was satisfied that the incident is unlikely to reoccur • AEMO had not classified the event as a credible contingency
1650 hrs 14 Nov 2013	Constraint Set Q-H13RS_SVC revoked
1103 hrs 30 Nov 2013	Current transformer and circuit breaker 5812 returned to service

6 Immediate Actions

This section assesses any immediate responses to the incident.

AEMO invoked constraint set Q-H13RS_SVC. This constraint was required whilst the Ross SVC was out of service to manage power system voltages upon further contingency events.

No further immediate actions were required to maintain power system security following the trip of Ross No.2 275 kV Busbar.

7 Follow-up Actions

This section assesses any follow-up actions taken to resolve the incident.

AEMO issued Market Notice 43846 at 1544 hrs to notify the market of the non-credible contingency event. This notification was within the two hour period in which AEMO is required to notify the market following a non-credible contingency event⁵.

Powerlink isolated the failed CT and the associated CB. This enabled the busbar, SCV and transformer to be returned to service approximately one hour after the busbar tripped. AEMO then revoked constraint set Q-H13RS_SVC after the Ross SVC had returned to service.

AEMO assessed whether or not to reclassify the event as a credible contingency.⁶ For this event AEMO was satisfied that the cause of the busbar trip had been identified and that that the busbar trip was unlikely to reoccur. AEMO then issued Market Notice 43848 at 1649 hrs to notify the market the event would not be reclassified as a credible contingency event.

⁵ AEMO, *Power System Security Guidelines*, v54 Section 10.3

⁶ For a non-credible contingency event AEMO is required to assess whether or not to reclassify the event as a credible contingency (NER v60 Clause 4.2.3A (c)) and to report how re-classification criteria were applied (NER v60 Clause 4.8.15 (ca)). AEMO has to determine if the condition that caused the non-credible contingency event has been resolved.

8 Power System Security

This section assesses how AEMO managed power system security over the course of the incident⁷.

For this incident the power system remained secure over the course of the incident. Power system frequency and voltages remained within limits and the fault was cleared within required timeframes. AEMO correctly invoked the relevant constraint and did not reclassify the incident as a credible contingency.

9 Conclusions

1. On 14 November 2013 at 1523 hrs the No.2 275 kV Busbar at Ross Substation correctly tripped due to an internal fault on current transformer. The failed CT was removed from the power system and the busbar was returned to service approximately one hour later.
2. Power system security was maintained over the course of the incident.

10 Recommendations

There are no recommendations as a result of this investigation

⁷ AEMO is responsible for power system security in the NEM and is required to operate the power system in a secure operating state (NER v60 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.