TRIP OF SOUTH EAST – TAILEM BEND NO.1 275KV LINE AND SOUTH EAST NO.1 SVC ON 26 MAY 2016

REVIEWABLE OPERATING INCIDENT REPORT UNDER THE NATIONAL ELECTRICITY RULES

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AEMO
AUSTRALIAN ENERGY MARKET OPERATOR

INCIDENT CLASSIFICATIONS

Classification	Detail
Time and date of incident	0851 hrs 26 May 2016
Region of incident	South Australia
Affected regions	South Australia
Event type	Loss of multiple transmission elements
Generation Impact	No generator was disconnected 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
CB	Circuit Breaker
kV	Kilovolt
MW	Megawatt
NER	National Electricity Rules
SVC	Static var compensator

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.

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1. OVERVIEW

This report relates to a reviewable operating incident[1] that occurred on 26 May 2016 at South East substation in South Australia. This incident involved the simultaneous trip of the South East – Tailem Bend No.1 275kV line (No.1 Line) and the South East No.1 static var compensator (No.1 SVC) and was caused by a protection mal-operation.

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

As 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.[2]

AEMO has concluded that:

1. The No.1 Line and No.1 SVC tripped due to a protection mal-operation as the result of damaged protection wiring.
2. The power system was maintained in a secure operating state during this event.

This report is prepared in accordance with clause 4.8.15(c) of the National Electricity Rules (NER). It is based on information provided by ElectraNet[3] and AEMO.

Australian Eastern Standard Time is used in this report.

2. THE INCIDENT

At 0851 hrs on 26 May 2016, the No.1 Line and the No.1 SVC tripped simultaneously.

The No.1 Line and No.1 SVC were returned to service at 0930 hrs and 1617 hrs respectively on 26 May 2016. Circuit breaker (CB) 6606 at South East substation remained out of service pending further investigation, and was returned to service at 1600 hrs on 16 June 2016.

No load or generation was lost as a result of this incident.

See Appendix A for a power system diagram illustrating the incident, and Appendix B for a chronological log of the incident.

The reason for investigating this event is that it involved the tripping of two transmission elements, which as a simultaneous disruptive event, is classified under the NER as a non-credible contingency event[4].

3. ELECTRANET INVESTIGATION

ElectraNet as the Transmission Network Service Provider (TNSP) for South Australia investigated this incident and provided the following information.

The trip of the No.1 Line and No.1 SVC resulted from the unexpected operation of the circuit breaker (CB) fail protection associated with CB 6606 at South East substation. While the trip of No.1 Line and No.1 SVC is a correct outcome for this protection operation, the protection should not have operated as there was no fault on the power system.

CB fail protection for CB 6606 can be initiated from the protection relays associated with No.1 Line, No.1 SVC and the No.1 Line reactor. However none of these protection relays operated.

[1] See NER clause 4.8.15(a)(1)(i), as the event relates to a non-credible contingency event; and the AEMC Reliability Panel Guidelines for Identifying Reviewable Operating Incidents.
[2] See NER clause 4.8.15(b).
[3] ElectraNet is the Transmission Network Service Provider (TNSP) for South Australia.
[4] NER clause 4.2.3(e).

Investigation of the protection system wiring for CB 6606 revealed a damaged cable associated with No.1 SVC protection. The cable was shorted to earth resulting in an inadvertent CB Fail initiate signal being generated and tripping the No.1 Line and No.1 SVC. The damaged cable was replaced and CB 6606 returned to service.

4. POWER SYSTEM SECURITY

AEMO is responsible for power system security in the NEM. This means AEMO is required to operate the power system in a secure operating state and return it to a secure state following a contingency event. This section assesses how AEMO managed how power system security over the course of this incident[5].

To ensure the power system was restored to and maintained in a secure operating state, AEMO invoked constraint sets S-TBSE[6] at 0900 hrs, V-2RP[7] and S-SE_VC_1[8] at 0905 hrs, an acceptable 14 minutes after the incident occurred. No other actions were required to manage power system security.

Constraint set S-TBSE was revoked at 0940 hrs after No.1 Line was returned to service. Constraint sets V-2RP and S-SE_VC_1 were revoked at 1630 hrs after No.1 SVC was returned to service.

4.1 Reclassification

After No.1 SVC was returned to service, AEMO assessed whether or not to reclassify the event as a credible contingency event[9]. For this incident, AEMO was satisfied that the cause had been identified and isolated and that the incident was unlikely to reoccur. AEMO did not reclassify this event as a credible contingency event.

The power system remained in a secure operating state over the course of this incident. AEMO correctly assessed the incident and did not reclassify the incident as a credible contingency event.

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[10] over the course of this incident.

For this incident, AEMO was required to inform the market on the following matters:

1. A non-credible contingency event - notify within two hours of the event.[11]
    - AEMO issued Market Notice 53526 at 0914 hrs – 23 minutes after the event.
2. Constraints invoked with interconnector terms on the LHS.[12]
    - AEMO issued Market Notice 53525 at 0920 hrs – 29 minutes after the event to advise that constraint sets S-TBSE, V-2RP and S-SE_VC_1 had been invoked.
    - AEMO issued Market Notice 53527 at 0941 hrs to advise that the South East- Tailem Bend line had returned to service and constraint set S-TBSE had been revoked.

[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] Voltage and oscillatory stability limits with a South East-Tailem Ben line out of service.
[7] Transient stability limits with any two SVCs at South East or Rowville out of service. One of the SVCs at Rowville was on a planned outage at this time.
[8] Transient and voltage stability limits with one SVC at South East out of service.
[9] 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).
[10] AEMO generally informs the market about operating incidents as the progress by issuing Market Notices – see AEMO website
[11] 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
[12] For short term outage AEMO is required to notify the Market of variances to interconnector transfer limits AEMO, *Power System Security Guidelines,* Section 22

- AEMO issued Market Notice 53528 at 1639 hrs to advise that the South East No.1 SVC had been returned to service and constraint sets V-2RP and S-SE_VC_1 had been revoked.

3. Reclassification, details, and cancelation of a non-credible contingency – notify as soon as practical.[13]
    - AEMO issued Market Notice 53528 at 1639 hrs to advise that the cause of the non-credible contingency had been identified and AEMO would not reclassify this event as a credible contingency event.

Over the course of this incident AEMO issued appropriate, timely and sufficiently detailed market information.

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.

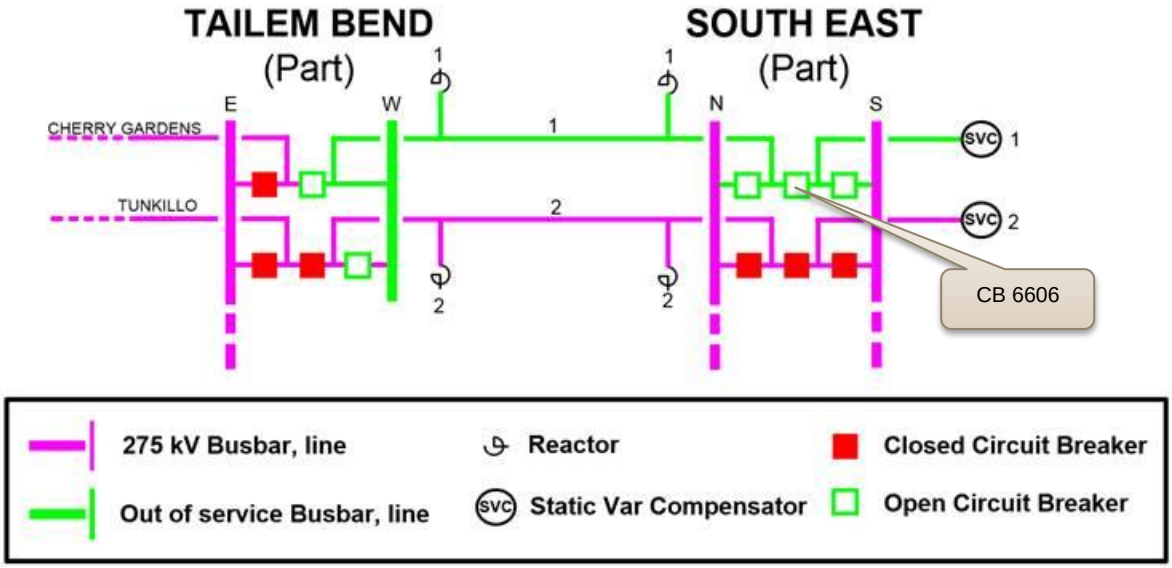
AEMO has concluded that:

1. The No.1 Line and No.1 SVC tripped due to a protection mal-operation as the result of damaged protection wiring.
2. The power system was maintained in a secure operating state during this event.

[13] AEMO is required to notify the market of a reclassification NER clause 4.2.3(g), details of the reclassification 4.2.3(c) and when AEMO cancels the reclassification 4.2.3(h)

APPENDIX A. SYSTEM DIAGRAM

Figure 1 shows the status of the power system immediately after the event.



APPENDIX B. - CHRONOLOGICAL LOG

Date and Time	Event
26 May 0851 hrs	South East – Tailem Bend No.1 275kV line and South East No.1 275kV SVC tripped
0900 hrs	Constraint set S-TBSE invoked
0905 hrs	Constraint sets V-2RP and S-SE_VC_1 invoked
0930 hrs	South East – Tailem Bend No.1 275kV line returned to service
0940 hrs	Constraint set S-TBSE revoked
1617 hrs	South East No.1 275kV SVC returned to service
1630 hrs	Constraint sets V-2RP and S-SE_VC_1 revoked
16 June 1600 hrs	South East CB 6606 returned to service.