



TRIP OF A 275 KV TRANSMISSION LINE AND SVC IN SOUTH AUSTRALIA ON 17 SEPTEMBER 2015

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

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VERSION RELEASE HISTORY

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INCIDENT CLASSIFICATIONS

Classification	Detail
Time and date of incident	1501 hrs Thursday 17 September 2015
Region of incident	South Australia
Affected regions	South Australia
Event type	Loss of Multiple transmission Elements
Generation Impact	No generator was disconnected or limited 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
No.1 Line	South East-Tailem Bend No.1 275 kV transmission line
No.1 SVC	No.1 275 kV Static VAR Compensator at South East Substation
NER	National Electricity Rules
SES	South East Substation
TBS	Tailem Bend Substation
VAR	Volt-amphere reactive



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 17 September 2015 at South East Substation (SESS) in South Australia. The incident involved the trip of a 275 kV transmission line and a Static VAR¹ Compensator (SVC).

The power system is operated such that it will remain in a satisfactory operating state² for the loss of single elements in the transmission network. Such events are defined as credible contingency³ events. AEMO considers the occurrence of these events to be reasonably possible and will ensure contingency plans are in place to minimise the impact on the power system following a credible contingency event. A non-credible contingency event is a contingency event other than a credible contingency event and usually involves multiple elements.

Under the National Electricity Rules (NER) this incident is classified a non-credible contingency that impacts critical transmission elements.⁴ AEMO is thereby required to assess power system security over the course of the incident. 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.⁵

AEMO concluded that:

1. The incident was caused by a circuit breaker protection function that operated unexpectedly. No evidence was found to explain why the protection operated.
2. Power system security was maintained over the course of the incident.

This report is based on information provided by ElectraNet⁶ and AEMO. National Electricity Market time (Australian Eastern Standard Time) is used in this report.

2. THE INCIDENT

On Thursday 17 September 2015 at 1501 hrs, at SESS, the circuit breaker fail protection (CBF) associated with circuit breaker (CB) 6606 unexpectedly operated. This in turn correctly opened CBs 6604 and 6610 at SESS and CBs 6536 and 6596 at Tailem Bend Substation (TBSS). As a result the South East to Tailem bend No.1 275 kV transmission line (No.1 Line), and No.1 SVC at SESS were de-energised. No.1 SVC protection then correctly tripped CB6606 due to loss of the 275 kV supply.

No customer load or generation was lost as a result of this incident. ElectraNet returned to service No.1 Line at 1524 hrs, 23 minutes after the initial trip, and No.1 SVC and CB6606 the following day at 1434 hrs and 1830 hrs respectively.

The reason for investigating this incident is that two critical transmission elements tripped in the absence of a power system fault. This means that the incident is classified a non-credible contingency event.

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

¹ Volt-ampere reactive (VAR) is a unit in which reactive power is expressed in an AC electric power system. Reactive power exists in an AC circuit when the current and voltage are not in phase.

² Refer to NER clause 4.2.2

³ Refer to NER clause 4.2.3

⁴ Refer to NER Clause 4.8.15(a)(1)(i) and AEMC Reliability Panel Guidelines for Identifying Reviewable Operating Incidents.

⁵ NER clause 4.8.15 (b)

⁶ ElectraNet is the Transmission Network Service Provider in South Australia



3. ELECTRANET INVESTIGATION

ElectraNet investigated this incident and found the following:

1. There was no fault on the power system and no protection systems operated that would have triggered the CBF function associated with CB 6606.
2. The CBF wiring and relays were checked and tested and were found to be installed and operating correctly without any defects.

ElectraNet did not find any evidence to explain why the CBF function operated.

4. POWER SYSTEM SECURITY

This section assesses how power system security was managed over the course of the incident.⁷

Immediately following the incident, at 1510 hrs AEMO invoked constraint sets S-SE_VC1⁸ and S-TBSE⁹. These constraint sets ensured the power system was in a secure state while No.1 SVC and No.1 Line were out of service.¹⁰

AEMO then assessed whether or not to reclassify the event as a credible contingency.¹¹ For this incident AEMO was satisfied that the cause had been identified (CBF on CB6606) and removed from service, and that the incident was unlikely to reoccur. This meant that no further actions were required to maintain power system security.

When CB 6606 was returned to service the following day AEMO did not reclassify the event as a credible contingency. This was because AEMO was satisfied that ElectraNet taken all reasonable steps to identify any defects and test the CBF protection to ensure that the event is unlikely to reoccur.

The constraint sets were revoked following the return to service of the respective SVC and line.

For this incident power system security was maintained over the course of the incident.

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 market¹² over the course of this incident.

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

1. A non-credible contingency event - notify within two hours of the event:¹³
AEMO issued Market Notice 49822 at 1526 hrs - 25 minutes after the event.
2. A constraint was invoked that could impact interconnector flow:¹⁴

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 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.

⁸ Constraint set required when one of the two SVCs at SES is out of service

⁹ Constraint set required when one of the two South East – Taillem Bend 275 kV transmission lines is out of service

¹⁰ 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)

¹¹ 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). AEMO has to determine if the condition that caused the non-credible contingency event has been resolved.

¹² AEMO generally informs the market about operating incidents by issuing Market Notices – see AEMO website

¹³ 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

¹⁴ For short term outages AEMO is required to notify the Market of variances to interconnector transfer limits: AEMO, *Power System Security Guidelines*, Section 22



AEMO issued Market Notice 49823 at 1541 hrs – 40 minutes after the event: the Victoria to South Australia interconnector could be impacted by constraint set S-SE_VC_1.

3. Updates to the non-credible contingency event – as information becomes available:¹⁵
AEMO issued Market Notice 49825 at 1705 hrs with new information: the cause of the event had been identified and the event was unlikely to reoccur.

For this incident AEMO issued appropriate, timely and sufficiently detailed market information.

6. CONCLUSIONS

For this incident, AEMO concluded that:

1. The incident was cause by a circuit breaker protection function that operated unexpectedly. No evidence was found to explain why the protection operated.
2. Power system security was maintained over the course of the incident.

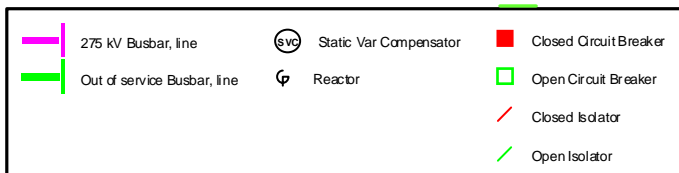
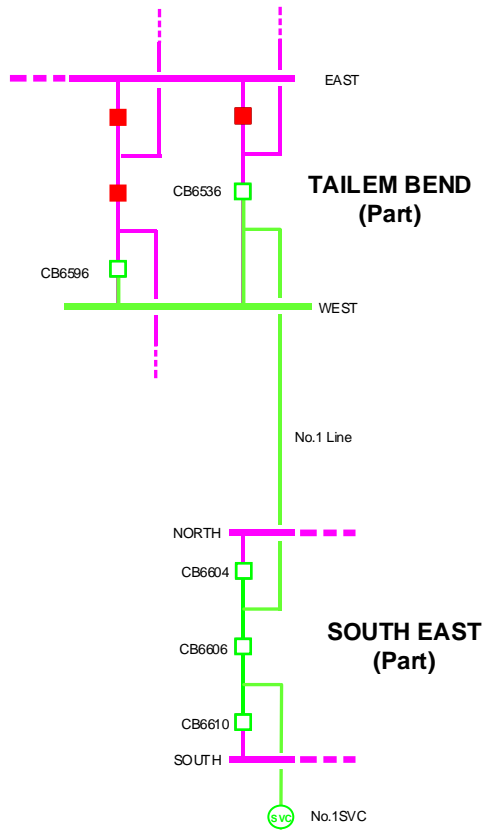
Overall, AEMO considered that provision and response of facilities and services were appropriate.

¹⁵ AEMO is required to notify the Market as it becomes aware of new and material information – NER Clause 4.2.3A(d)



APPENDIX A. – POWER SYSTEM DIAGRAM

The power system immediately after the incident.





APPENDIX B. – INCIDENT EVENT LOG

Event Log for Incident

Time and Date	Event
1501 hrs Thur 17 Sept 2015	CB6606 CBF operated – CBs 6536, 6596, 6604, 6610, and 6606 opened South East-Tailem Bend No.1 275 kV transmission line tripped No.1 SVC at SES tripped
1510	AEMO invoked constraints S-TBSE and S-SE_VC1
1524 hrs	ElectraNet closed CBs 6536 , 6596 at TBS and 6604 at SES, and returned South East-Tailem Bend No.1 275 kV transmission line to service
1526 hrs	AEMO issued Market Notice 49822 – notification of event
1530 hrs	AEMO revoked constraint set S-TBSE
1541 hrs	AEMO issued Market Notice 49823 – notification of constraints affecting interconnector
1705 hrs	AEMO issued Market Notice 49825 – update to 49822 – cause identified
1433 hrs Fri 18 Sept 2015	ElectraNet closed CB 6610 at SES
1424 hrs	ElectraNet returned to service No.1 SVC at SES
1505 hrs	AEMO revoked constraint set S-SE_VC1
1900 hrs	ElectraNet closed CB 6606 at SES Power system returned to pre-incident state