TRIP OF CLARE SOUTH – TOWNSVILLE SOUTH 132 KV TRANSMISSION LINE ON 24 JUNE 2015

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

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AEMO
AUSTRALIAN ENERGY MARKET OPERATOR

VERSION RELEASE HISTORY

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INCIDENT CLASSIFICATIONS

Classification	Detail
Time and date of incident	1737 hrs Wednesday 24 June 2015
Region of incident	QLD
Affected regions	QLD
Event type	TT – 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
Line 7130	Clare South–Townsville South-Invicta Mill 7130 132 kV line (Line 7130)
MW	Megawatt
NER	National Electricity Rules
SVC	Static VAR Compensator

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 24 June 2015 in North Queensland. This incident involved the trip of the Clare South–Townsville South-Invicta Mill 7130 132 kV line (Line 7130) and the trip of a Static VAR Compensator[1] (SVC) at Strathmore 275 kV substation.

The power system is operated such that it will remain in a satisfactory[2] operating state for the loss of single elements in the transmission network. Such events are defined as credible contingency[3] events. AEMO considers the occurrence of these events to be reasonably possible and ensures 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.

AEMO is required to assess power system security over the course of this incident as the incident is classified as a non-credible contingency under the National Electricity Rules (NER).[4] 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 trip of Line 7130 was caused by a sugar cane fire under the line.
2. The trip of the SVC was caused by an unbalanced capacitor bank within the SVC. The capacitor bank was subsequently rebalanced and returned to service.
3. Power system security was maintained over the course of the incident.

This report is based on information provided by Powerlink[6], Wilmar Sugar Pty Ltd[7] and AEMO. National Electricity Market time (Australian Eastern Standard Time) is used in this report.

2. THE INCIDENT

At 1737 hrs on Wednesday 24 June 2015, Line 7130 tripped and auto-reclosed. At the same time the SVC at Strathmore 275 kV station also tripped. No load or generation was lost as a result of this incident.

Line 7130 remained in service and did not trip again. The SVC remained out of service and, following remedial work, was returned to service on the 3 July 2015.

At the time of the incident there was a sugar can burn-off in the vicinity of Line 7130. Such burn-offs can cause power lines to trip as the burn passes close to power lines.

The Invicta Mill, with its associated generator and load, is a tee connection on Line 7130. The generator and load were unaffected by the trip of Line 7130 because Invicta had opened the tee connection prior to the sugar cane burn-off.

[1] A static VAR compensator is a set of electrical devices for providing fast-acting reactive power on high-voltage electricity transmission networks
[2] Refer to NER 4.2.2
[3] Refer to NER 4.2.3
[4] 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] Powerlink is the Transmission Network Service Provider in Queensland.
[7] Wilmar Sugar Pty Ltd is the Registered Participant for Invicta Sugar Mill.

The reason for investigating this incident is that the simultaneous trip of line 7130 and the SVC is a non-credible contingency event. See Appendix A for a diagram illustrating the incident and Appendix B for a chronological log of the incident.

3. POWERLINK INVESTIGATION

Powerlink investigated this incident and found that the trip and auto-reclose of Line 7130 was due to a sugar cane fire under the line which caused a fault on the line. The trip and auto-reclose of Line 7130 was expected for this type of fault.

For the SVC trip, Powerlink found that it tripped on capacitor imbalance protection initiated by power system disturbance caused by the trip of Line 7130. Powerlink later identified that the capacitor banks within the SVC had become unbalanced beyond the normal tolerance. This change in balance in capacitor banks can occur over time.

Powerlink subsequently rebalanced the capacitor bank by rearranging elements of the capacitor bank such that the unbalance was within tolerances. Powerlink found that the protection settings for the SVC capacitor balance were appropriate and have not been changed.

4. POWER SYSTEM SECURITY

This section assesses how power system security was managed over the course of the incident.[8]

Immediately following the incident Line 7130 had returned to service but the SVC remained out of service. To return the power system to a secure state, whilst the SVC was out of service, AEMO invoked the constraint set Q-H35STM_SVC. This was done eight minutes after the incident which ensured that requirement to return the power system to a secure state within 30 minutes following a contingency event was met.[9]

The following day, 25 June at 1249hrs, Powerlink returned the SVC to service to test and observe the operation of the SVC. AEMO then revoked the constraint set Q-H35STM_SVC thirty minutes after the SVC had returned to service. This short delay was to ensure the SVC was working for the constraint was removed.

At this stage Powerlink had not resolved the reason for the of SVC trip. To maintain power system security, until the reason had been identified, AEMO reclassified the simultaneous trip of Line 7130 and the SVC as a credible contingency.

After approximately 2.5 hours Powerlink removed the SVC from service for remedial work. Powerlink had identified that the SVC capacitor bank spill current was higher than expected. AEMO invoked the constraint set Q-H35STM_SVC to maintain power system security whist the SCV was out of service. AEMO did not cancel the reclassification at this stage because the reason for the SVC trip had not been resolved.

[8] 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 ensure that the power system is maintained in, or returned to, a secure operating state following a contingency event.
[9] 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)

On the 26 June, the following day, Powerlink informed AEMO that the reason for the SVC trip had been identified and resolved. Because the issue had been resolved AEMO then removed the reclassification of Line 7130 and the SVC.

Powerlink returned the SVC to service on 3 July 2015 following unrelated maintenance works that required the SVC out of service. AEMO revoked constraint set Q-H35STM_SVC at 1455 hrs on 3 July following the return to service of the SVC at 1451 hrs.

Over the course of the incident the power system security was maintained in accordance with NER and associated procedural requirements.

5. MARKET INFORMATION

AEMO is required by the NER and associated operating procedures to inform the market about incidents as they progress. This section assesses how AEMO informed the market over the course of this incident.

AEMO generally informs the market of operational matters by issuing Market Notices. Over the course of this incident AEMO issued three market:

1. Market Notice 49203 at 1836 hrs 24 June 2015 approximately sixty minutes after the event to notify the market of a non-credible contingency event[10].
2. Market Notice 49204 at 1326 hrs 25 June approximately forty minutes after SVC was returned to service to notify the market that the incident would be reclassified as a credible contingency.
3. Market Notice 49211 at 1105 hrs on 26 June to cancel the reclassification following notification from Powerlink that SVC was operational.

Over the course this incident AEMO informed the market as required with appropriate and timely information.

6. CONCLUSIONS

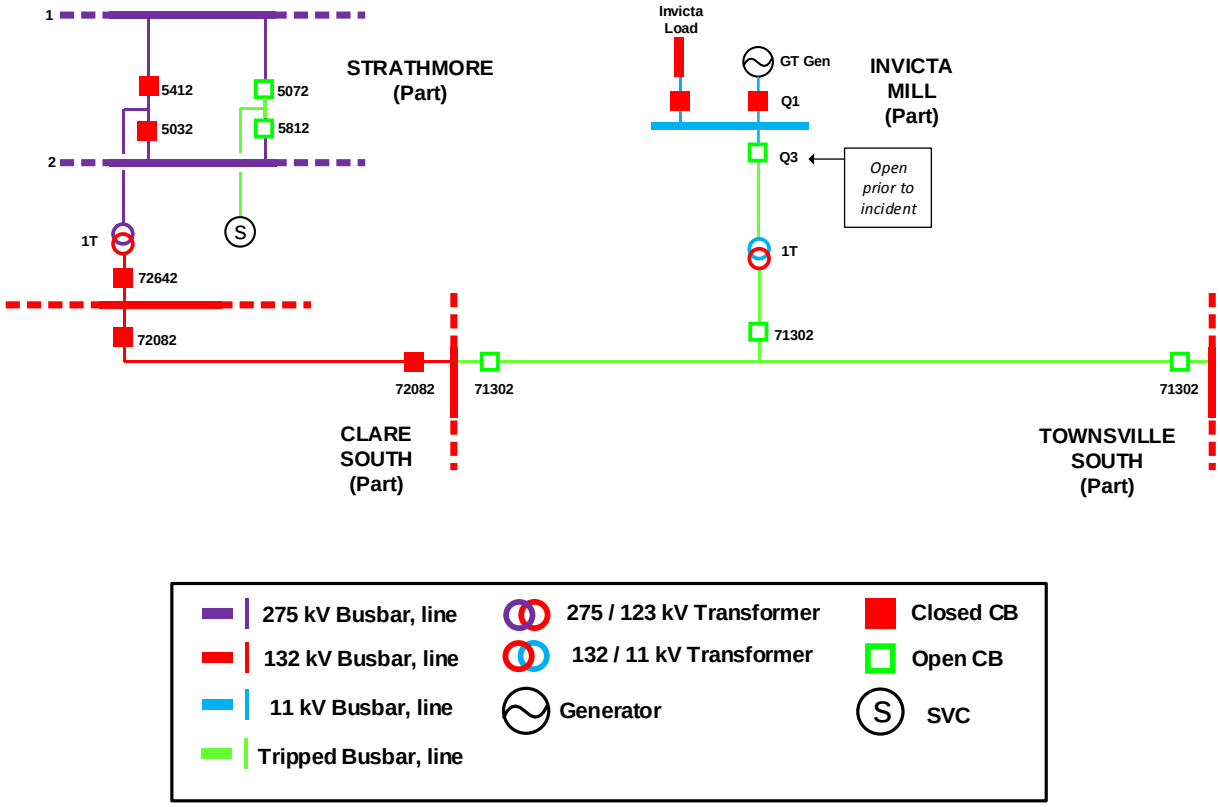
AEMO concluded that:

1. The trip of Line 7130 was caused by sugar cane fire in the vicinity of the Line 7130.
2. The trip of the SVC was triggered by the power system disturbance initiated by trip of Line 7130 and was caused by capacitor imbalance. The SVC capacitors have since been rebalanced.
3. The provision and response of facilities and services were appropriate and power system security was maintained over the course of the incident.
4. There are no outstanding issues as a result of this incident.

[10] 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

7. APPENDIX A - DIAGRAM

Diagram illustrating the power system immediately after the incident (before Line 7130 auto-reclosed)



APPENDIX B - CHRONOLOGICAL LOG

Time and Date	Event
1737 hrs 24 June 2015	Trip and auto-reclose of the Clare South – Townsville South tee Invicta Mill 132 kV line and simultaneous trip of the SVC at Strathmore 275 kV station. The SVC remained out of service.
1745 hrs 24 June 2015	AEMO invoked constraint set Q-H35STM_SVC.[11]
1836 hrs 24 June 2015	AEMO issued Market Notice 49203 informing the Market of the non-credible event.
1241 hrs 25 June 2015	Powerlink indicated that the trip of the SVC at Strathmore was caused by the operation of capacitor imbalance protection, and requested returning the SVC to service to conduct tests on the capacitor bank associated with the SVC.
1249 hrs 25 June 2015	SVC at Strathmore station was returned to service.
1320 hrs 25 June 2015	AEMO revoked constraint set Q-H35STM_SVC.
1326 hrs 25 June 2015	AEMO issued market Notice 49204 reclassifying the simultaneous trip of the Clare South – Townsville South tee Invicta Mill 132 kV line and the SVC at Strathmore 275 kV station as a credible contingency event until the cause of the non-credible event was resolved.
1510 hrs 25 June 2015	Powerlink notified AEMO that the SVC will be taken out of service for remedial work.
1510 hrs 25 June 2015	AEMO invoked constraint set Q-H35STM_SVC.
1513 hrs 25 June 2015	SVC at Strathmore station was taken out of service.
1105 hrs 26 June 2015	AEMO issued Market Notice 49211cancelling the reclassification of this event as credible event. Powerlink had informed AEMO that the cause of the non-credible event had been resolved.
1451 hrs 03 July 2015	SVC at Strathmore station was returned to service.
1455 hrs 03 July 2015	AEMO revoked constraint set Q-H35STM_SVC.

[11] Constraint set Q-H35STM_SVC offsets the voltage stability limit between Central and North QLD for trip of feeder or generation while the SVC at Strathmore station is out of service.