POWER SYSTEM OPERATING INCIDENT REPORT – TRIP OF 1 AND 2 LIAPOOTAH – PALMERSTON - WADDAMANA 220 KV TRANSMISSION LINES 30 NOVEMBER 2012

PREPARED BY: System Performance and Commercial

DATE: 30 January 2013

FINAL

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Abbreviations and Symbols

Abbreviation	Term
DI	Dispatch Interval
EMMS	Electricity Market Management System
EMS	Energy Management System
MW	Megawatt
NEM	National Electricity Market
NER	National Electricity Rules

Contents

Incident summary

Date and time of incident	30 November 2012 at 2038 hrs
Region of incident	Tasmania
Affected regions	Tasmania
Event type	TT – Loss of multiple transmission elements
Primary cause	ENVI & OTHER – Environment and Other
Impact	Nil
Associated reports	Nil

1 Introduction

At 2037 hrs and 2038 hrs respectively on 30 November 2012, the No.1 and No. 2 Liapootah – Palmerston - Waddamana 220 kV transmission lines tripped out of service.

This report has been prepared under clause 4.8.15 (c) 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 Transend. Data from AEMO's Energy Management System (EMS) and Electricity Market Management System (EMMS) has also been used in analysing the incident.

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

2 Pre-contingent system conditions

On the evening of 29 November 2012, a bushfire ignited northwest of Arthurs Lake in Tasmania, and Transend sent observers to the site to monitor the risk to its transmission lines. At 2124 hrs 29 November 2012, AEMO issued Market Notice No. 40447, notifying the market that the loss of No.1 and No. 2 Liapootah – Palmerston - Waddamana 220 kV transmission lines was reclassified as a credible contingency. The reclassification was in accordance with AEMO's bushfire contingency reclassification process[1].

At 0905 hrs 30 November 2012, the reclassification was broadened to include Palmerston – Waddamana 110 kV transmission line, which was in accordance with AEMO's bushfire contingency reclassification process[2]. Subsequently, Transend advised AEMO that its observers assessed that the bushfire was no longer a threat to these transmission lines. Whilst AEMO made a record of this decision, the analysis according to the bushfire contingency reclassification process was not documented[3].

At 1007 hrs AEMO issued Market Notice No. 40454, notifying the market of both the change in reclassification, and cancellation of the reclassification.

At 1524 hrs 30 November 2012, AEMO issued Market Notice No 40458, notifying the market that the loss of the same three transmission lines was reclassified as a credible contingency due to the same bushfire in proximity to the lines. The reclassification was based on advice from Transend's observers on site, and was in accordance with AEMO's bushfire re-classification process[4]. At the request of Transend, the Palmerston – Waddamana 110 kV transmission line was de-energised to minimise potential damage, as it is constructed with copper conductors.

Transend observers were kept at a safe distance from the bushfire throughout the day by the fire services, but were permitted to move closer to the bushfire later in the afternoon. From a position a few kilometres distant from the bushfire, the observers determined that flame and smoke levels had significantly reduced. Subsequently, Transend advised AEMO that their observers determined that the bushfire was no longer a threat to the transmission lines.

At 1943 hrs, AEMO issued Market Notice No. 40461, notifying the market that the reclassification was cancelled and Palmerston – Waddamana 110 kV transmission line returned to service. The revised observation that the fire was no longer a risk to the transmission lines resulted in a risk

[1] Risk weighting = 19, threshold = 9. Refer to section 12.3, SO_OP_3715 AEMO Power System Security Guidelines.

[2] Risk weighting = 19, threshold = 9.

[3] The bushfire contingency reclassification process assigns weightings to various parameters to determine if a reclassification is warranted. The observation of the Network Service Provider carries the highest weighting. The revised observation that the fire was no longer a threat to the transmission lines resulted in a risk assessment below the threshold that warranted a reclassification.

[4] Risk weighting = 17, threshold = 9.

assessment below the threshold that warranted a reclassification. Whilst AEMO made a record of this decision, the analysis according to the bushfire contingency reclassification process was not documented.

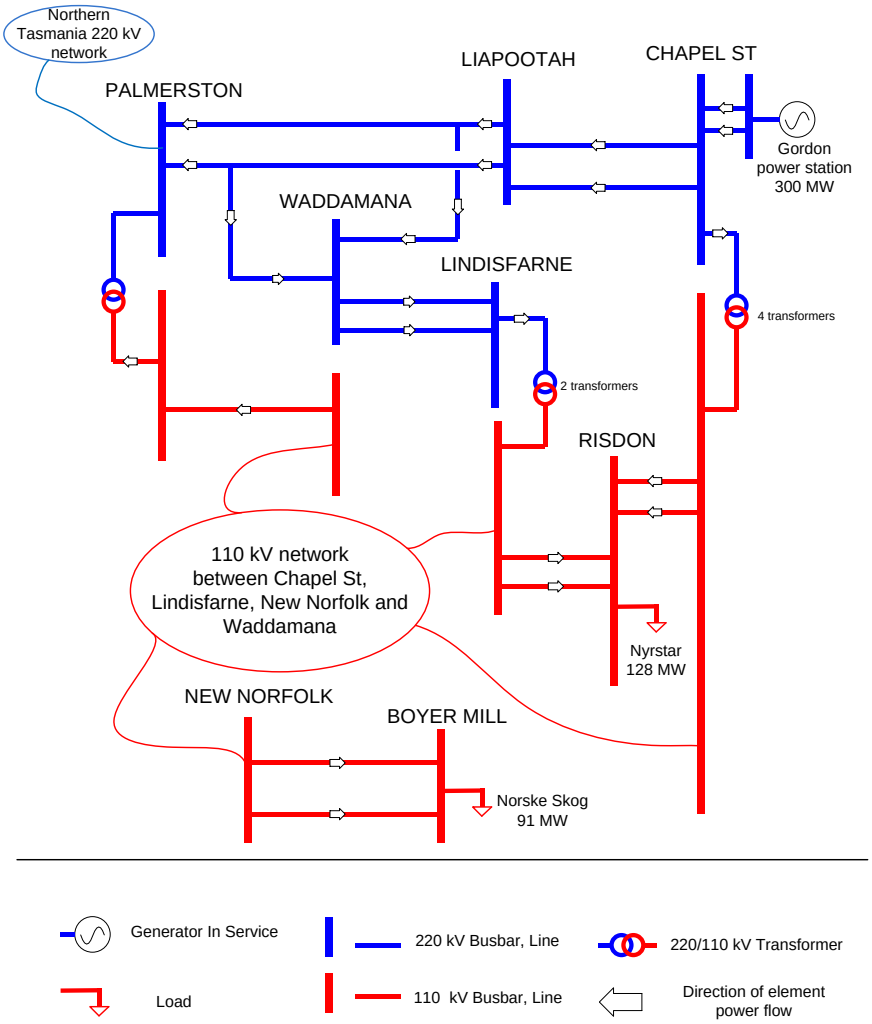
A summary of the events leading up to the incident is shown in Table 1.

Table 1: Summary of events prior to incident

Date and time	Events/comments
29/11/2012 21:20 hrs	Constraint set T-LIPM_N-2 invoked.
29/11/2012 21:24 hrs	Loss of both Liapootah – Palmerston – Waddamana 220 kV transmission lines re-classified as a credible contingency in Market Notice No. 40447.
30/11/2012 09:05 hrs	Loss of Palmerston – Waddamana 110 kV transmission line added to the credible contingency re-classification previously declared in Market Notice No. 40447. Constraint set T-LIPM_PMWA_N-3 invoked.
30/11/2012 09:10 hrs	Constraint set T-LIPM_N-2 revoked.
30/11/2012 09:25 hrs	Constraint set LIPM_PMWA_N-3 revoked.
30/11/2012 10:07 hrs	Market Notice No. 40454 issued, advising of re-classification change at 0905 hrs and cancelling re-classification declared in Market Notice No. 40447.
30/11/2012 15:10 hrs	Palmerston – Waddamana 110 kV transmission line de-energised. Constraint set T-PMWA invoked.
30/11/2012 15:15 hrs	Constraint set T-LIPM_PMWA_N-3 invoked.
30/11/2012 15:24 hrs	Loss of both Liapootah – Palmerston – Waddamana 220 kV transmission lines and Palmerston – Waddamana 110 kV transmission line reclassified as a credible contingency in Market Notice No. 40458.
30/11/2012 19:40 hrs	Palmerston – Waddamana 110 kV transmission line returned to service. Constraint sets T-PMWA and T-LIPM_PMWA_N-3 revoked.
30/11/2012 19:43 hrs	Market Notice No. 40461 issued, cancelling re-classification declared in Market Notice No. 40458.

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, 2035 hrs 30 November 2012.



3 Summary of incident

At 2037 and 2038 hrs 30 November 2012 respectively, No. 1 and No. 2 Liapootah – Palmerston - Waddamana 220 kV transmission lines each tripped out of service due to a fault between the red phase and blue phase. Transend advised that the observers on site advised the bushfire had flared up again. The observer's view was that burning kerosene bushes[5] produced large quantities of smoke in a relatively short time, causing arcing between the red phase and blue phase.

In response to the under-voltage disturbance, loads at Norske Skog and Nystar reduced by 8 MW and 91 MW respectively. The combined effect of the line trips and load reduction loaded the parallel Palmerston – Waddamana 110 kV line to 228 MVA, exceeding its dynamic rating of 157 MVA.

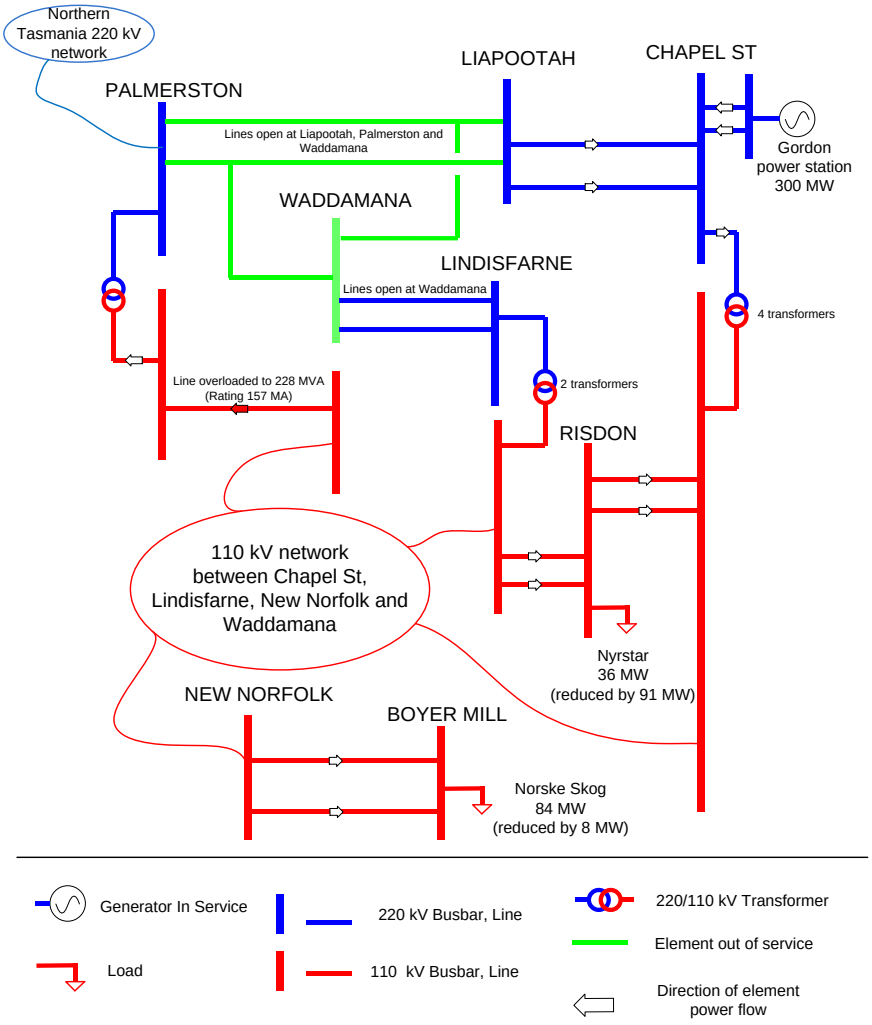
Table 2: Summary of events during the incident

Date and time	Events/comments
30/11/2012 20:37 hrs	No. 1 Liapootah – Palmerston – Waddamana 220 kV transmission line trips out of service.
30/11/2012 20:38 hrs	No. 2 Liapootah – Palmerston – Waddamana 220 kV transmission line trips out of service.

The status of the power system immediately after the incident is shown in Figure 2.

[5] *Ozothamnus hookeri:* a shrub that grows in New South Wales and Tasmania.

Figure 2 - Status of the power system immediately after the incident, 2040 hrs 30 November 2012.



4 Immediate Actions Taken

In DI ending 2045 hrs, constraint equation T>T_NIL_BL_IMP_4F (system normal, to avoid overload of No. 3 Hadspen – Palmerston 110 kV transmission line on trip of 220/110 kV transformer at Palmerston) bound, and consequently Gordon power station was given a dispatch target from 299 MW to 116 MW. AEMO immediately contacted Hydro Tasmania to confirm that Gordon would meet the dispatch target and relieve the overload on Palmerston – Waddamana 110 kV transmission line. By 2043 hrs, the loading on Palmerston – Waddamana 110 kV transmission line was reduced below the line's dynamic rating. The result was the power system was in an unsatisfactory state for five minutes.

Constraint set T-X_LIPM (outage of both Liapootah – Palmerston - Waddamana 220 kV transmission lines) was invoked at 2045 hrs. At 2051 hrs, AEMO issued Market Notice No. 40462, advising the market that a non-credible contingency event had occurred. At 2120 hrs, both transmission lines were returned to service. Constraint set T-X-LIPM was revoked at 2130 hrs.

Constraint set T-LIPM_PMWA_N-3 (loss of both Liapootah – Palmerston - Waddamana 220 kV transmission lines and Palmerston – Waddamana 110 kV transmission line declared credible) was invoked at 2130 hours. At 2135 hours, AEMO issued Market Notice No 40464, advising the market that the loss of all three transmission lines was reclassified as a credible contingency. Transend did not request that Palmerston – Waddamana 110 kV transmission line be de-energised and it remained in service.

5 Follow-up Actions

The bushfire continued to burn during the evening of 30 November 2012, and throughout 1 December 2012. During this period both Liapootah – Palmerston – Waddamana 220 kV transmission lines tripped a number of times as noted in Table 3, each time due to red phase to blue phase faults. Due to the under-voltage disturbances from these faults, load was lost at Norske Skog and Nystar.

Table 3: Summary of subsequent trips and loss of load on 1 December 2012.

Date and time	Events/comments
1/12/2012 11:26 hrs	No.2 Liapootah – Palmerston – Waddamana 220 kV transmission line trips out of service. 110 MW of load lost at Nystar. 14 MW of load lost at Norske Skog.
1/12/2012 12:24 hrs	No 1 Liapootah – Palmerston – Waddamana 220 kV transmission line trips out of service. 5 MW of load lost at Norske Skog.
1/12/2012 12:27 hrs	No 2 Liapootah – Palmerston – Waddamana 220 kV transmission line trips out of service. 10 MW of load lost at Nystar. 13 MW of load lost at Norske Skog.
1/12/2012 12:31 hrs	No 1 Liapootah – Palmerston – Waddamana 220 kV transmission line trips out of service. 8 MW of load lost at Nystar.

On 2 December 2012, Transend's observers advised that the bushfire was no longer a threat to the transmission lines. At 0810 hrs 2 December 2012, AEMO issued Market Notice No. 40503, advising the market that the bushfire had subsided and the reclassification was cancelled. Constraint set T-LIPM_PMWA_N-3 was revoked at 0815 hrs. The cancellation was in accordance with AEMO's bushfire contingency reclassification process[6].

6 Power System Security Assessment

Each fault on the Liapootah – Palmerston - Waddamana 220 kV transmission lines was cleared within 120 ms as required by the NER. After the double circuit trip on 30 November the power system was initially in an unsatisfactory state but was returned to a secure state within five minutes.

The Palmerston – Waddamana 110 kV transmission line was overloaded by up to 45% for five minutes.

While AEMO correctly assessed the situation in respect to potential reclassification due to bushfires as described in SO_OP_3715, the results of the analysis were not recorded in all instances. AEMO has reviewed this procedure and found that the requirement to record all reclassification assessments is not clearly defined. This procedure will be revised accordingly.

7 Conclusions

The trip of the Liapootah – Palmerston - Waddamana 220 kV transmission lines on 30 November 2012 and 1 December 2012 was the result of phase to phase faults due to smoke from a bushfire in proximity to the transmission lines. The power system was in an unsatisfactory state but was returned to a secure state within five minutes.

AEMO's decisions to reclassify contingencies as credible and cancel reclassifications during this incident were made on the best available advice from Transend bushfire observers on site. The criteria published in section 12.3 of SO_OP_3715 Power System Security Guidelines for the reclassification of bushfire contingency events were correctly followed. AEMO did not document its

[6] Risk weighting = 2, threshold = 9.

risk analysis for the cancellation of bushfire contingency reclassifications on two occasions during the incident.

8 Recommendations

AEMO shall revise SO_OP_3715, to explicitly require AEMO to document its risk assessment results, as part of the record of decisions made in the bushfire contingency reclassification process. This shall be completed before 28 February 2013.