

POWER SYSTEM OPERATING INCIDENT REPORT – TRIP OF B 220 KV BUSBAR AT GEORGE TOWN ON 27 NOVEMBER 2012.

PREPARED BY: System Performance & Commercial

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FINAL

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Abbreviations and Symbols

Abbreviation	Term
BLGC	Basslink Georgetown Converter Station
CB	Circuit Breaker
CCGT	Combined Cycle Gas Turbine
DI	Dispatch Interval
EMMS	Electricity Market Management System
EMS	Energy Management System
FCAS	Frequency Control Ancillary Service
kV	Kilovolt
MW	Megawatt
MWh	Megawatt hour
NEM	National Electricity Market
NEMDE	National Electricity Market Dispatch Engine
NOS	Network Outage Schedule
TVGCS	Tamar Valley Power Station Generator Contingency Scheme

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Incident summary

Date and time of incident	27 November 2012 at 0732 hrs.
Region of incident	Tasmania.
Affected regions	Tasmania.
Event type	BB - Busbar Trip.
Primary cause	PTN & CTR - Protection and Control
Impact	S- Significant
Associated reports	NIL

1 Introduction

At 0732 hrs on 27 November 2012, the B 220 kV Busbar at George Town Substation tripped due to an incorrect protection operation (operator involved) that occurred during work on the protection scheme at George Town Substation. The George Town–Tamar Valley No 3 220 kV transmission line and the George Town–Comalco No 4 220 kV transmission line also tripped. Prior to the event, the Tamar Valley Combined Cycle Power Station was generating 202 MW, and the George Town–Comalco No 4 220kV transmission line was loaded to 106 MW (Rio Tinto Aluminium Smelter load).

The event led to a total generation reduction of 202 MW and an interruption to load of 337 MW.

Tripping of the George Town–Tamar Valley No 3 220 kV transmission line resulted in a reduction of generation of 202 MW which is greater than the Tamar Valley Power Station Generator Contingency Scheme¹ (TVGCS) threshold of 144MW. As a result, the TVGCS operated to trip the selected Temco and Nyrstar load blocks. However, load blocks at Rio Tinto Aluminium Smelter (101 MW) connected to the George Town–Comalco No 5 220 kV transmission line, and further load blocks at Nyrstar (28 MW) also tripped unexpectedly.

The George Town–Comalco No 4 220kV transmission line supplies the auxiliaries of the load connected to George Town–Comalco No 5 220 kV transmission line. Therefore, when the George Town–Comalco No 4 220kV transmission line tripped and interrupted auxiliary supplies to Rio Tinto load blocks, the load blocks at Rio Tinto also tripped.

Further load blocks at Nyrstar tripped due to oversensitive control/protection settings within their plant.

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 and AETV Power. 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

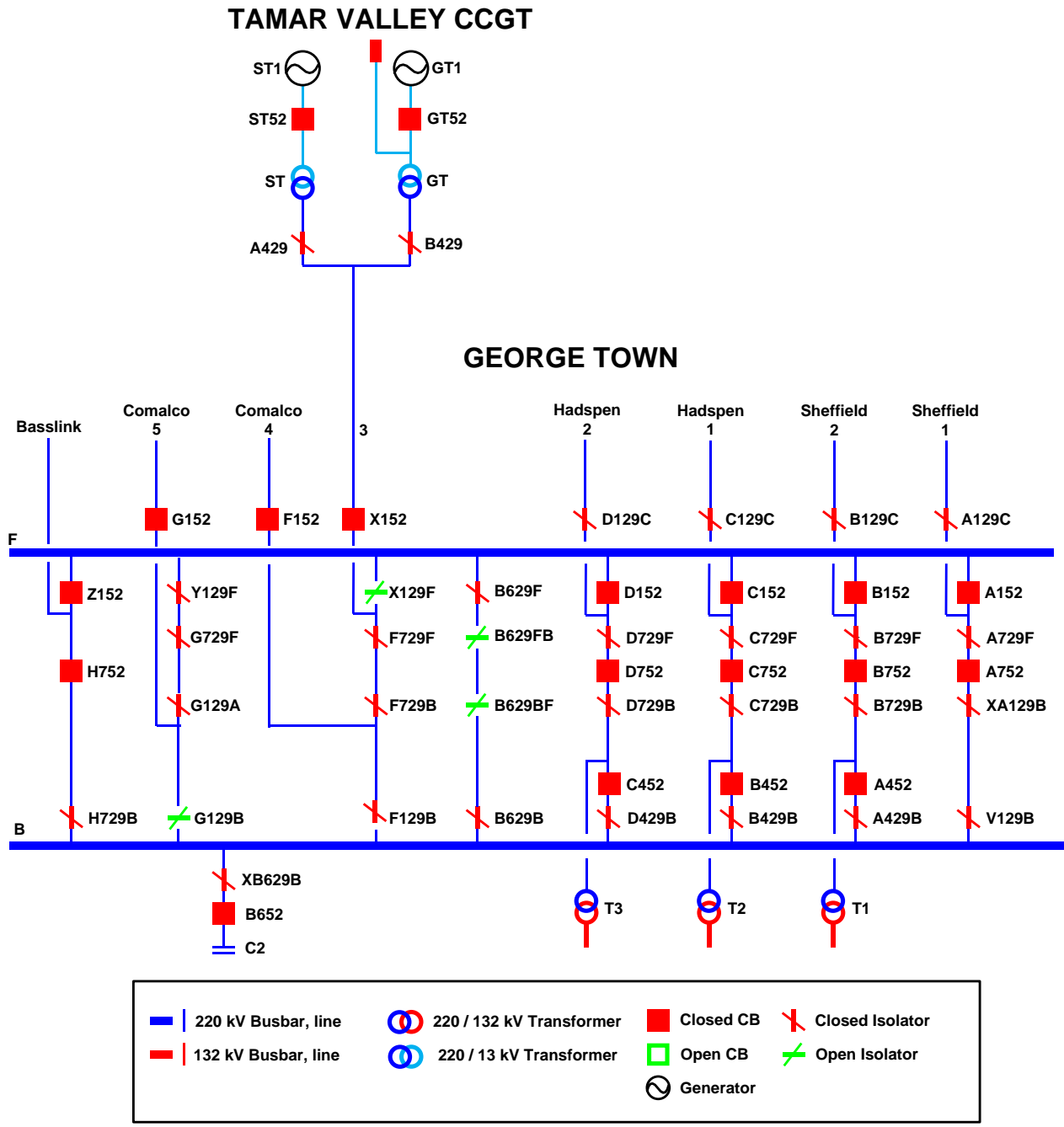
Prior to 0732 hrs, there was a planned outage of a protection scheme at George Town Substation to upgrade the George Town Substation bus zone A protection.

No primary equipment was out of service at that time.

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.

¹ The Tamar Valley Power Station Generator Contingency Scheme (TVGCS) is designed to interrupt load (selected load blocks at Temco and Nyrstar) in the event of a trip of the Tamar Valley Power Station CCGT with a generated output exceeding 144MW.

Figure 1 – Status of the power system prior to the incident



3 Summary of Events

Table 1 shows the summary and sequence of events.

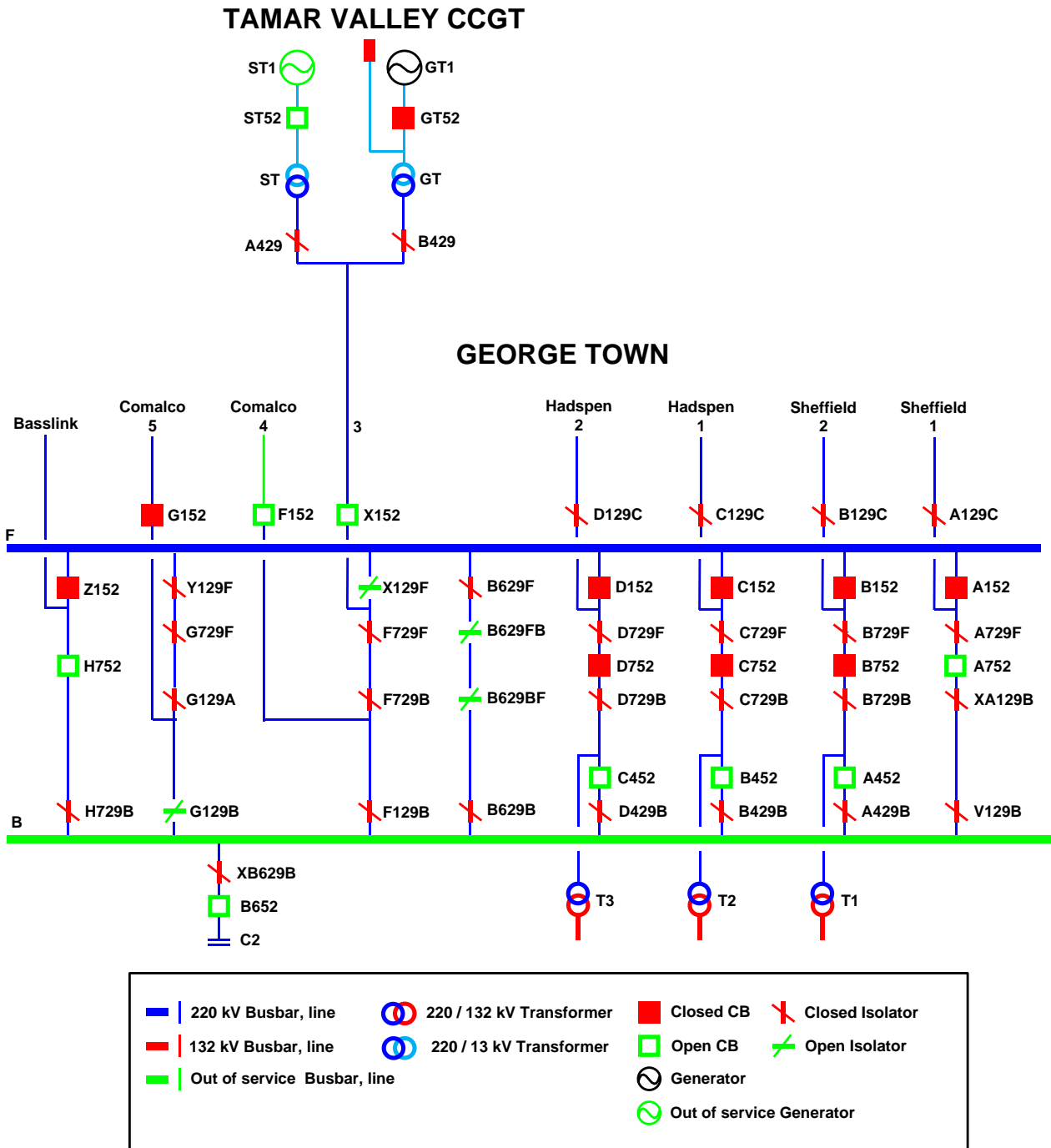
Table 1: Summary and sequence of events

Time (hrs)	Event
0732	<p>The B 220 kV busbar at George Town Substation, the George Town–Comalco No 4 220 kV transmission line (106 MW), and the George Town–Tamar Valley No 3 220 kV transmission line (202 MW) all tripped.</p> <p>The Tamar Valley Power Station CCGT was disconnected with output of 202 MW. The Tamar Valley Power Station Steam Turbine (ST1) immediately tripped. An electrical island was established with the Tamar Valley Power Station Gas Turbine (GT1) supplying the Tamar Valley Power Station’s auxiliary equipment, a load of approximately 4 MW.</p> <p>At the time of islanding, the power system frequencies met the frequency operating standards for this type of event. Voltages remained within limits.</p> <p>Temco load block (74 MW) tripped by operation of the TVGCS.</p> <p>Nyrstar RZ6 (Nyrstar’s sixth load block; 28 MW) tripped by operation of the TVGCS.</p> <p>Nyrstar RZ5 (Nyrstar’s fifth load block; 28 MW) tripped due to oversensitive control/protection settings within their plant.</p> <p>A potline tripped at Rio Tinto Aluminium Smelter following trip of the George Town–Comalco No 5 220 kV transmission line (101 MW).</p>
0739	Permission to proceed with restoration of the B 220 kV busbar at George Town.
0749	The B 220 kV Busbar at George Town Substation was restored.
0751	The George Town–Comalco No 4 220 kV transmission line restored.
0804	The George Town–Tamar Valley No 3 220 kV transmission line returned to service. (Note that Tamar Valley Power Station GT1 was shutdown prior to the George Town – Tamar Valley Power Station No 3 220 kV transmission line being restored).
0844	<p>Market Notice No 40416 issued to advise that the cause of this non credible contingency event has been identified.</p> <p>AEMO decided not to reclassify this event as a credible contingency event.</p>
1115	Tamar Valley Power Station CCGT returned to service.

The Basslink frequency controller maintained Tasmanian region frequency within the normal frequency operating band.

The status of the power system immediately after the incident is shown in Figure 2. For clarity, only the equipment relevant to the incident has been included in the diagram.

Figure 2 - Status of the power system immediately after the incident



The Tamar Valley Power Station Gas Turbine (GT1) remained in-service supplying the Tamar Valley Power Station’s house load and energising the following :-

- the Tamar Valley Power Station Gas Turbine 220/14.5 kV Generator Transformer (GT)
- the Tamar Valley Power Station Steam Turbine 220/13.2 kV Generator Transformer (ST) to the open CB ST52, and
- the off-loaded George Town–Tamar Valley No 3 220 kV transmission line to the open 220 kV CB X152 at George Town Substation.

4 Immediate Actions Taken

At 0749 hrs, the B 220 kV busbar at George Town Substation was returned to service.

At 0804 hrs, AEMO gave permission to restore load in steps of 30 MW. Load restoration was completed by 0830 hrs.

Tamar Valley Power Station combined cycle gas turbine came on load at 1115 hrs (total cleared for 71 MW).

Transend believes that this event is unlikely to reoccur because it was initiated by incorrect operation (operator involved).

After considering Transend's information, AEMO determined that the event would not be reclassified as a credible contingency event.

5 Follow-up Actions

Transend subsequently investigated the reasons for protection operation that occurred during the work on the protection scheme at George Town Substation. There was an incorrect labelling of a cable within the bus zone protection wiring which the test procedures had not identified. The cable labelling is now corrected and the test procedures are modified.

Contractors are currently reviewing the control and protection settings of the Nyrstar equipment. The TVGCS has been reconfigured, and excludes Nyrstar load blocks since 1 January 2013.

6 Power System Security Assessment

The power system frequencies in the Tasmania mainland and the electrical island² with Tamar Valley Power Station GT1 remained within the relevant Frequency Operating Standards and voltages remained within limits. The power system remained in a secure operating state throughout the incident.

7 Conclusions

After receiving advice from Transend, AEMO correctly applied the criteria published in section 12 of its Power System Security Guidelines in assessing the incident. Given the circumstances, reclassification of similar incidents as a credible contingency event was not required.

The power system remained in a secure operating state during the incident. The provision and response of facilities and services was adequate in relation to power system security. The actions taken were adequate to maintain power system security.

Transend has investigated the event and advised AEMO of the outcomes and corrective actions taken within the requested timeframe.

8 Recommendations

There are no recommendations.

² The maximum frequency in the electrical island was 53.85 Hz and achieved 4.85 seconds after separation. The relevant frequency operating standard for a separation event applying to an island in the Tasmania region is a containment band of 47.0 to 55.0 Hz. The island frequency returned to the normal operating frequency band in approximately 35 seconds following the incident and remained within the band until restoration.