

# POWER SYSTEM INCIDENT REPORT: SIMULTANEOUS TRIP OF AETV CCGT AND OCGT UNITS – 30/09/2009

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FINAL

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## 1. Introduction

At 08:52 hrs on 30 September 2009, AETV combined cycle gas turbine (CCGT) TVCC201<sup>1</sup> and open cycle gas turbine (OCGT) TVPP104<sup>2</sup> tripped resulting in a loss of 261 MW of generation in Tasmania. Subsequently, Bell Bay Three generating units (BBTHREE1, BBTHREE2 and BBTHREE3) were brought online between 09:07-09:13 hrs but these generating units tripped out of service at 09:15 hrs.

This report has been prepared under clause 4.8.15 of the Rules 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.

Information for this report has been supplied to AEMO by Aurora Energy. Data from AEMO's Energy Management and Market Systems has also been used in analysing the event.

All references to time in this report refer to Market time (Australian Eastern Standard Time).

## 2. Summary of Events

At 08:52 hrs on 30 September 2009, Tamar Valley CCGT TVCC201 and the OCGT TVPP104 tripped resulting in a loss of 261MW of generation in Tasmania. The trip of the Tamar Valley CCGT TVCC201 units caused the Tamar Power Station Generation Contingency Scheme to shed 56 MW of customer load supplied from Risdon substation.

Prior to the event, CCGT TVCC201 gas turbine was at 137MW and steam turbine was at 67MW. The OCGT TVPP104 was at 57 MW.

There are separate gas supplies feeding the TVCC201 and TVPP104 generating units. The main programmable logic controller (PLC) of Bell Bay Metering Station which controls these gas supplies failed and the standby PLC failed to take over, resulting in a loss of pressure in both the gas supplies and thus tripping off the generating units.

Bell Bay Three generating units (BBTHREE1, BBTHREE2 and BBTHREE3) were not in service at the time of the event, but were brought online between 09:07-09:13 hrs. They were fed from a separate gas supply which was also controlled by the failed main PLC. Consequently, there was loss of pressure in that supply as well tripping off the three Bell Bay Three units at 09:15 hrs.

However, both Gas Infrastructure Provider's control room and the Bell Bay Metering station indicated gas supply pressure of 3200 kPa (normal) whereas at the TVCC201 generating units the supply pressure reading was 2200 kPa (low). This was due to incorrect data being sent from the main PLC to both the Gas Infrastructure Provider's Control room and the Bell Bay Metering Station.

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<sup>1</sup> TVCC 201 consists of a 208 MW Combined Cycle gas turbine and a steam turbine connected to Georgetown 220kV busbar via isolator switches.

<sup>2</sup> TVPP 104 consists of a 58 MW open cycle gas turbine connected to the Bell Bay/Tamar V 110kV busbar.

The Bell Bay Metering Station control system was repaired and all three gas supplies were manually re-pressurised and made available by 14:58hrs.

TVCC201 gas turbine and the steam turbine came back into service at 16:47 hrs and at 17:14 hrs respectively.

Figures 1-2 below show the network topology at Georgetown substation and its connection to TVCC201 and TVPP104 generating units before and after the trip.

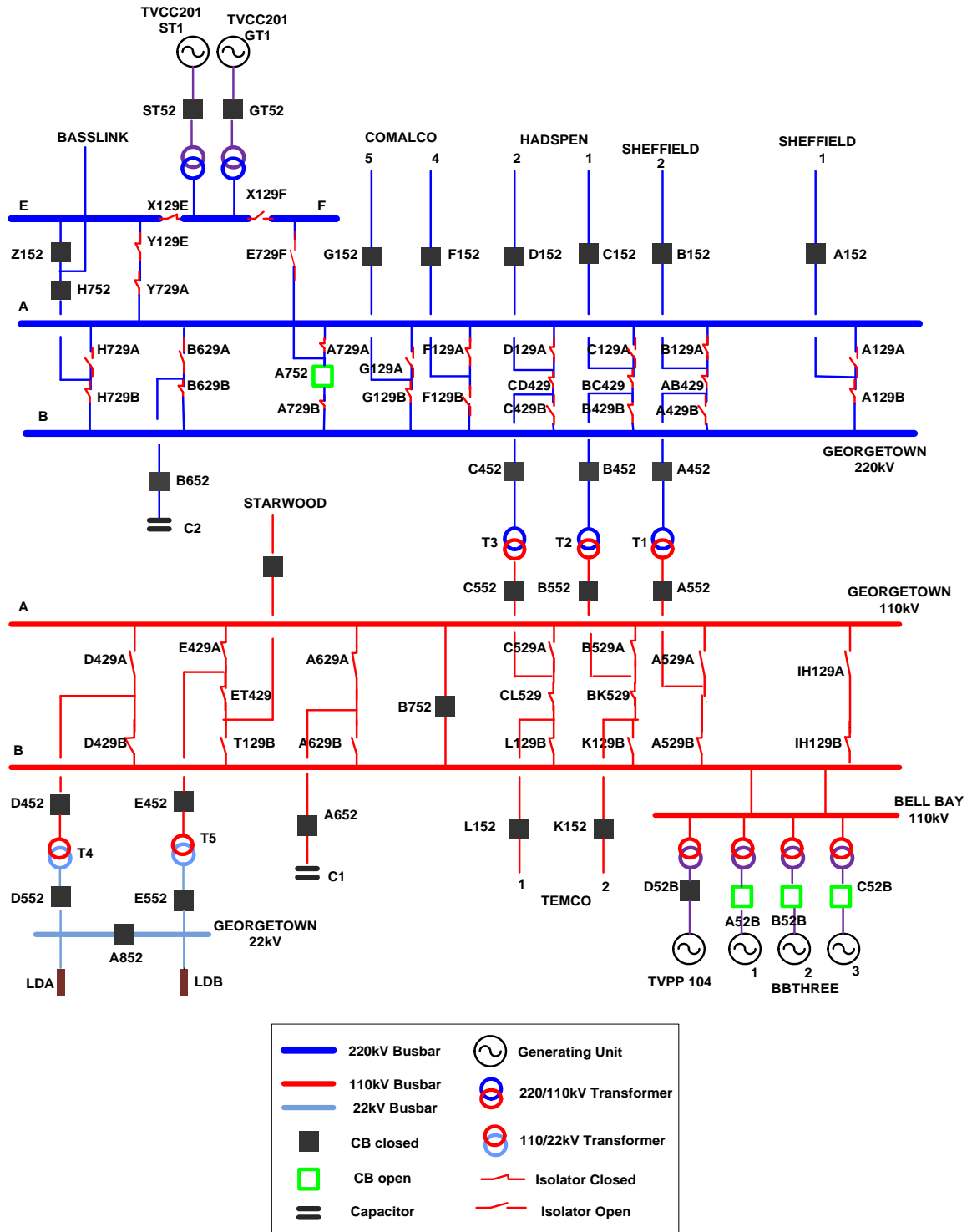


Figure1 above: Simplified Network Topology at George Town substation and connection to TVCC201/TVPP104 generating units before trip

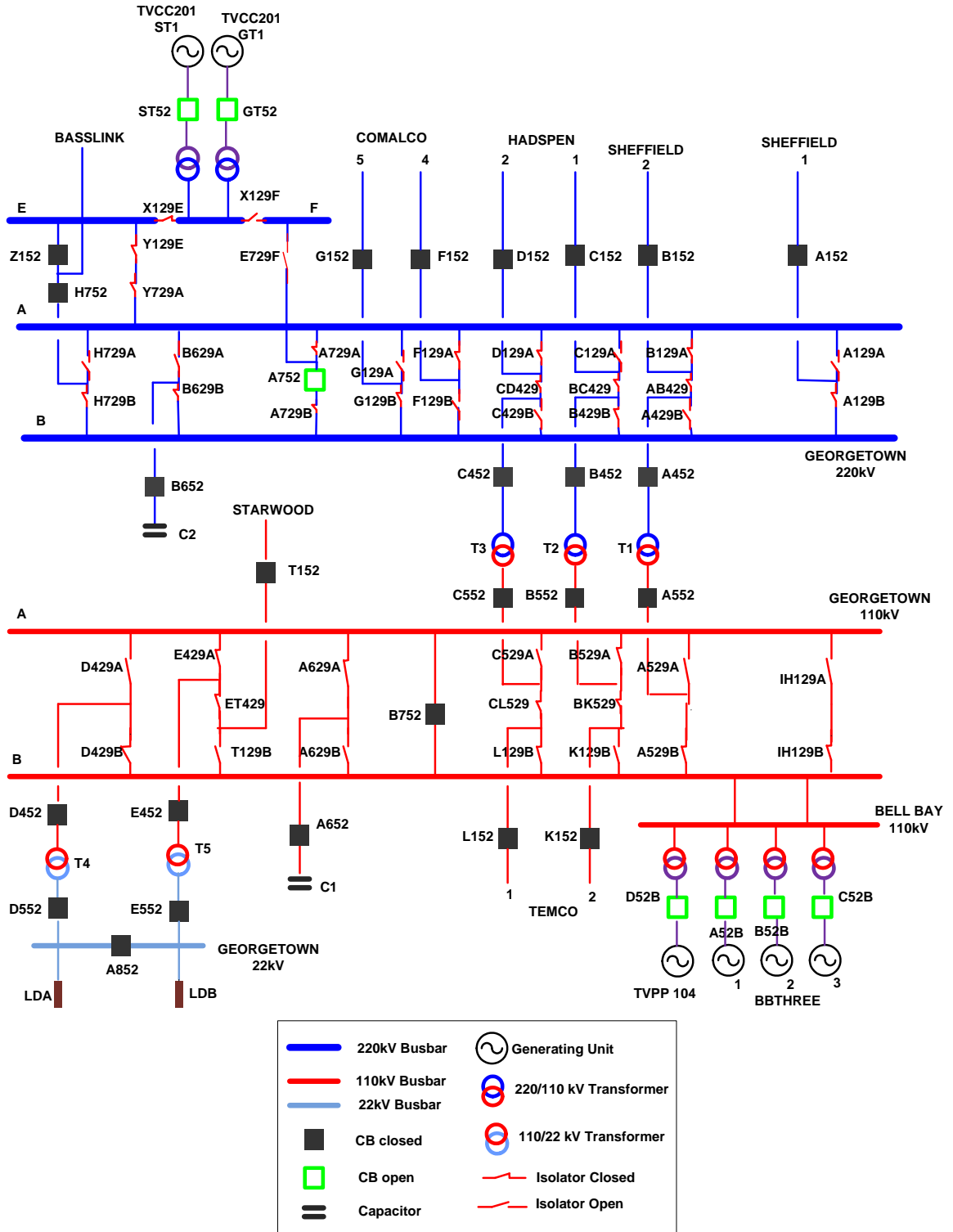


Figure 2 above: Simplified Network Topology at George Town substation and connection to TVCC201/TVPP104 generating units after trip

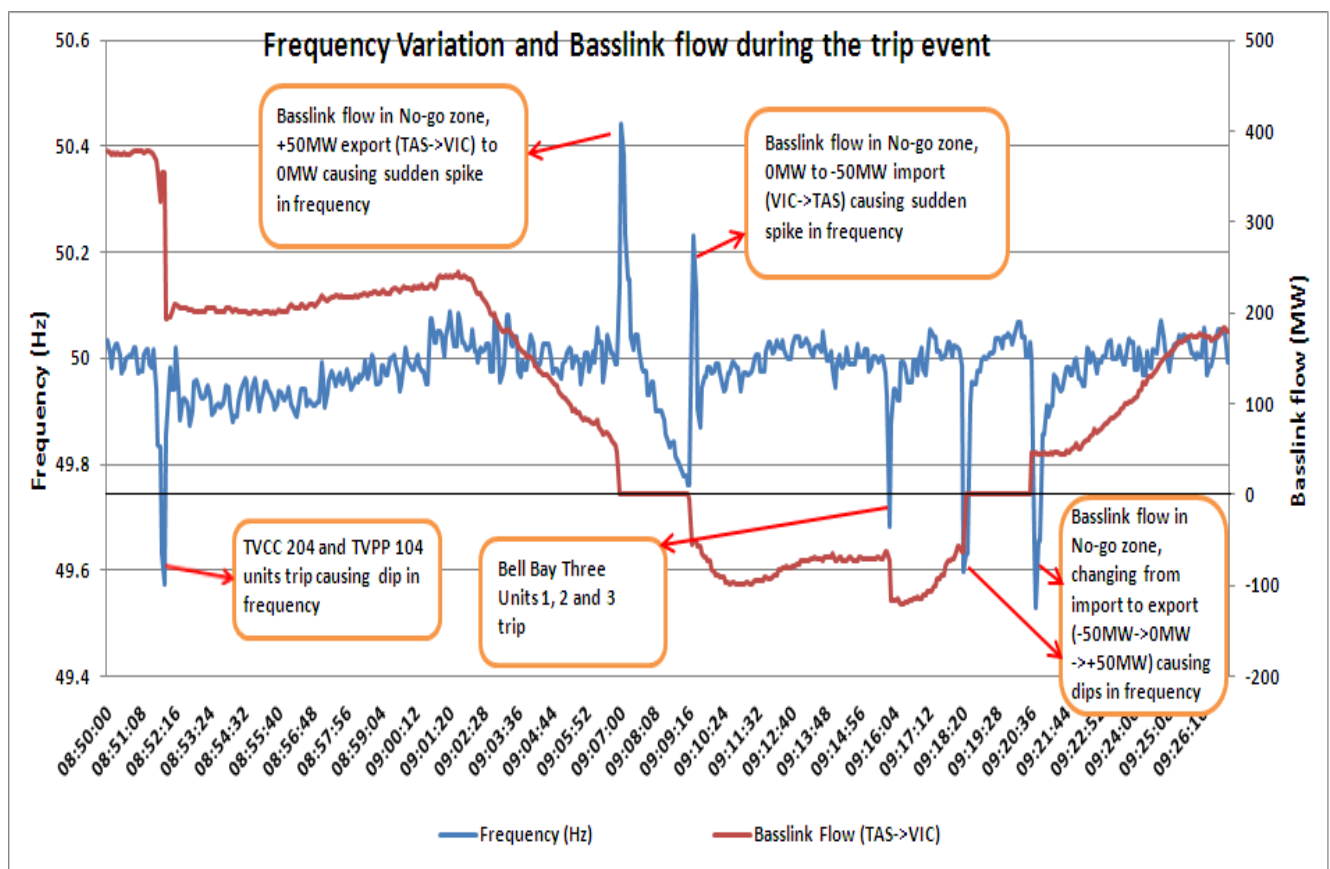
### 3. Power System Security Assessment

The loss of TVCC201 and TVPP104 generating units resulted in a loss of 261MW of generation and tripping 56 MW of load.

There were no violations of Power System Security due to this event.

The normal operating frequency band for Tasmania is between 49.85Hz – 50.15Hz. At the time the TVCC 204 and TVPP104 tripped (08:52 hrs), the frequency declined to a minimum of 49.57Hz and stayed below the normal frequency band for 12 seconds. However, the frequency band that applies for multiple contingency events in Tasmania as per the frequency operating standards is 47- 55Hz. The frequency did not reach 47Hz at any instant of time during this event hence the frequency in Tasmania remained within the frequency operating standard.

The frequency variation and Basslink flow at and around the time of the event is shown below:



As seen in the plot above, the first dip in frequency around 08:52 hrs indicates the trip of the TVCC201 and TVPP104 generating units. Basslink was exporting to Victoria at the time. Soon after the trip, the export reduced and eventually reversed to importing into Tasmania. The first spike in frequency around 09:07 hrs was a result of Basslink flow in the No-go

zone<sup>3</sup> (+50MW to 0MW) while reversing flow from export to import. There's a 2 minute waiting period (09:07-09:09 hrs) before Basslink actually starts to import power. The second spike in frequency is a result of Basslink exiting the No-go zone (between 0MW->-50MW).

The dip in frequency at 09:15 hrs indicates the trip of the Bell Bay Three units BBTHREE1, BBTHREE2 and BBTHREE3. Soon after, the Basslink flow reverses yet again from import into Tasmania to export to Victoria. The dip in frequency at 09:18 hrs indicates Basslink flow entering the No-go zone (-50MW to 0MW) while reversing flow from import to export. Again there's a 2 minute waiting period (09:18-09:20 hrs) before Basslink starts to export power. The last dip in frequency after 09:20 hrs is a result of Basslink exiting the No-go zone (between 0MW-> 50MW).

The voltage at the Bell Bay/Tamar Valley substation was within normal operating limits.

Based on advice received from the Gas infrastructure provider, AEMO deemed that there was no above normal risk and hence reclassification of loss of both generating units was not required.

## **4. Conclusion**

The loss of Tamar Valley Power Station (TVCC 201, TVPP 104 and, 23 minutes later, Bell Bay Three Units BBTHREE1, BBTHREE2 and BBTHREE3) was a result of low pressure in the gas supplies due to the failure of the Main and standby PLCs. The Gas Operations crew responded immediately to rectify the fault at Bell Bay Metering Station and have assured AETV that suitable measures are in place to ensure such an outage does not occur in future.

## **5. Recommendations**

There are no recommendations for this event.

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<sup>3</sup> The Basslink converters require that the minimum MW level that they can operate is at +/- 50 MW. When the power flow is required to change direction, the converters have to ramp to the minimum MW level, block to 0 MW, discharge and de-ionise the cable, recharge the cable in the opposite polarity, and deblock to 50 MW. Due to the length and design of the DC cable, this process takes two minutes to complete.