

POWER SYSTEM OPERATING INCIDENT REPORT – SIMULTANEOUS TRIP OF ALL DARLING DOWNS POWER STATION UNITS ON 13 FEBRUARY 2013

PREPARED BY: Systems Performance and Commercial

DATE: 3 April 2013

FINAL

Disclaimer

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Abbreviations and Symbols

Abbreviation	Term
CB	Circuit Breaker
EMMS	Electricity Market Management System
EMS	Energy Management System
FCAS	Frequency Control Ancillary Service
MW	Megawatt
NEM	National Electricity Market
NEMDE	National Electricity Market Dispatch Engine

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Incident summary

Date and time of incident	13 February 2013 at 0505 hrs.
Region of incident	Queensland
Affected regions	Queensland
Event type	GG – Loss of multiple generating units
Primary cause	PS – Power Station internal issues
Impact	VS – Very Significant
Associated reports	Nil

1 Introduction

At 0505 hrs on 13 February 2013, Darling Downs Power Station Units (GT1, GT2, GT3 and STG0) tripped simultaneously with a total generation reduction of 340 MW.

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 Origin Energy. 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

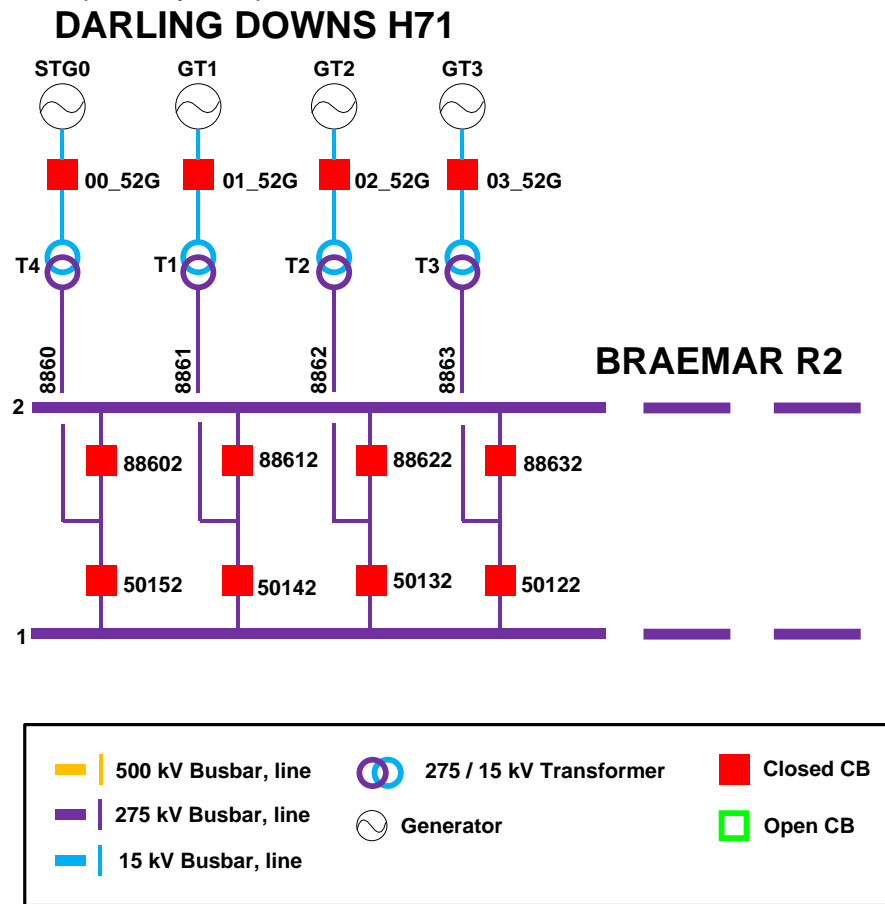
Previous to the event Darling Downs Power Station was generating a total of 340 MW as indicated in Table 1 below.

Table 1 – Darling Downs generation prior to the incident

Generator	MW
STG0	142
GT1	66
GT2	66
GT3	66

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



3 Summary of Events

At 0505 hrs on 13 February 2013, Darling Downs Power Station Units (GT1, GT2, GT3 and STG0) tripped simultaneously from a total of 340 MW.

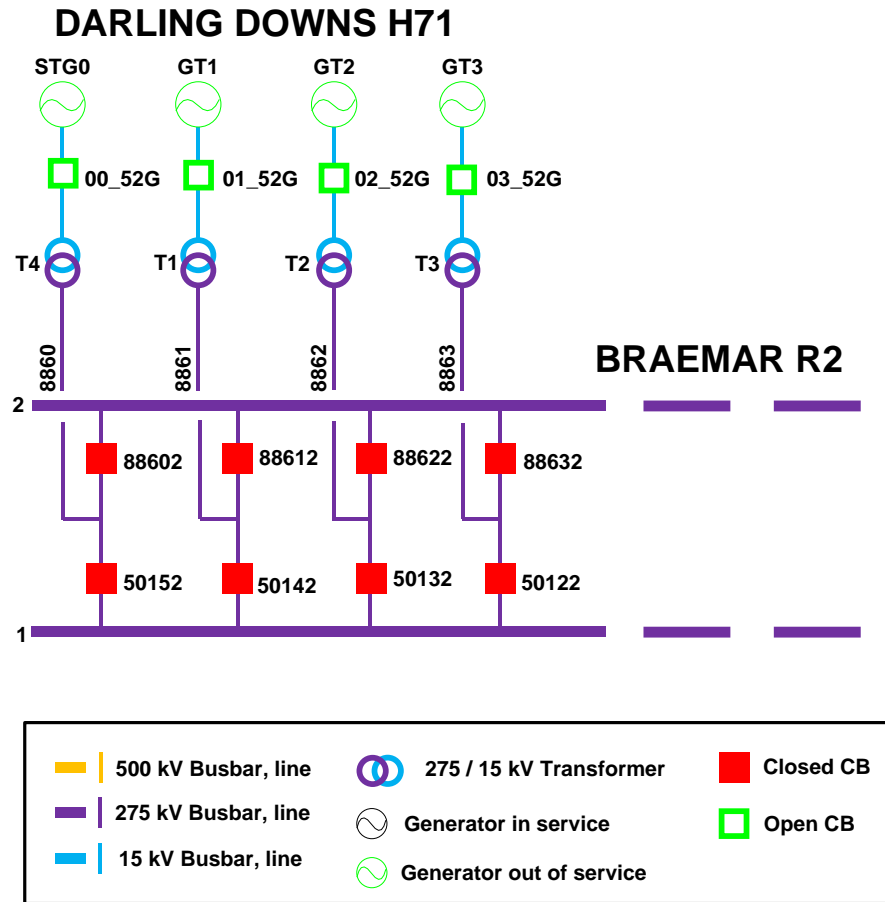
The key events that took place during this incident are summarised in Table 1 below:

Table 1: Summary of events

Time hh:mm	Events / Comments
05:05	Darling Downs Power Station Units GT1, GT2, GT3, and STG0 all tripped simultaneously from a total of 340 MW.
05:33	AEMO issued Market Notice No.41449 informing about the multiple generation event. The cause for the trip was unknown at the time.
13:13	Origin Energy informed AEMO that problems with the communications network seem to be the cause for the trip.
15:30	Darling Downs units synchronised and started ramping up their output
15:36	AEMO issued Market Notice No.41462 informing about the reclassification of the multiple event as credible. Constraint set F-Q_DD_N-2 was invoked.

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

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



4 Immediate Actions Taken

At 0533 hrs AEMO issued Market Notice No. 41499 informing the market about the multiple generation event.

The Darling Downs Power Station units remained unavailable until 1530 hrs.

5 Follow-up Actions

At 1313 hrs Origin Energy informed that the tripping of the units appears to be caused by a failure in the control system communications network used by Origin Energy. AEMO informed Origin Energy that the trip of all units at Darling Downs Power Station will be reclassified as a credible contingency event if no further advice is received on return of the units to service.

At 1536 hrs AEMO issued Market Notice No.41462 informing the Market about the reclassification of the trip of all units at Darling Downs Power Station as a credible contingency event. The FCAS constraint set F-Q_DD_N-2 was invoked at the same time to protect the power system against the increased risk of multiple generation loss.

The communications network at Darling Downs Power Station includes two main switches (namely 91 and 92 switches) and is designed to survive the failure of either of those switches.

In case of failure on one of the main switches, the communication protocol used in the switches would allow them to reconfigure communication routes based on a cost calculation. The time to reconfigure the routes will normally be between 1 to 2 seconds.

Further investigation from Origin Energy and General Electric (the original equipment manufacturer), has identified undocumented bridge loops¹ in some of the communication network compartments as the most likely cause for the communications network failure.

Origin Energy has indicated that General Electric reported that these links have been used in past designs but are no longer included in new designs as they cause network issues, specifically time delays in the route reconfiguration up to 10 seconds.

The investigation also has revealed a minor date discrepancy in log files for switch 92 which may be indication of a power cycle or soft reset of the switch.

The possible failure of switch 92 and the increased delay in reconfiguring the routes, due to the undocumented bridges, is the suspected cause for the communication failure and the subsequent trip of the units.

Origin Energy will remove the undocumented bridges and will replace switch 92 at the next plant outage opportunity.

6 Power System Security Assessment

The power system voltages and frequency remained within the normal operating bands and the power system remained in a secure operating state throughout the incident.

AEMO correctly applied the criteria published in section 12 of its Power System Security Guidelines in reclassifying the trip of all units at Darling Downs Power Station as a credible contingency event. AEMO's action was appropriate and timely. The reclassification remains in place until the required modifications are completed. This is expected to occur by the end of May 2013.

7 Conclusions

The trip of all units at Darling Downs Power Station was caused by a failure in Origin Energy's communications network.

The failure in the communications network is suspected to be caused by a fault in one of the main communication switches and the presence of undocumented bridges loops which resulted in increased time for the reconfiguration of communication routes.

AEMO correctly reclassified the trip of all units at Darling Downs Power Station as a credible contingency event. The reclassification will remain in place until the required modifications are completed which is expected by the end of May 2013.

The power system voltages and frequencies remained within the normal operating bands and the power system remained in a secure operating state throughout the incident.

8 Recommendations

Origin Energy will remove the undocumented bridges in their communications network and will replace switch 92 at the next plant outage opportunity. This is expected to occur by the end of May 2013. Origin Energy should inform AEMO when this work is completed.

¹ A bridge loop is an external wire that connects parts of an electrical circuit.