

POWER SYSTEM OPERATING INCIDENT REPORT – MULTIPLE GENERATING UNITS TRIP AT GLADSTONE POWER STATION ON 27 JANUARY 2013

PREPARED BY: Systems Performance and Commercial

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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
kV	Kilovolt
MW	Megawatt
NEM	National Electricity Market

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Incident summary

Date and time of incident	27 January 2013 at 1956 hrs
Region of incident	Queensland
Affected regions	Queensland
Event type	GG – Loss of multiple generating units
Primary cause	PS – Power Station Internal Issues
Impact	Significant
Associated reports	Nil

1 Introduction

At 1956 hrs on 27 January 2013, generating units 3, 4 and 5 at Gladstone Power Station tripped and unit 6 reduced its output from 112 MW to approximately 0 MW in less than 2 minutes. This incident resulted in reduction of approximately 290 MW of generation. Gladstone Power Station Unit 1 remained in-service during the incident.

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 NRG Gladstone Operating Services, CS Energy and Powerlink. 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 days previous to the event, the Central Queensland area experienced severe weather conditions which saturated the coal supplies to Gladstone Power Station.

Prior to the event units 1, 3, 4, 5 and 6 at Gladstone Power Station were generating as indicated in Table 1 below.

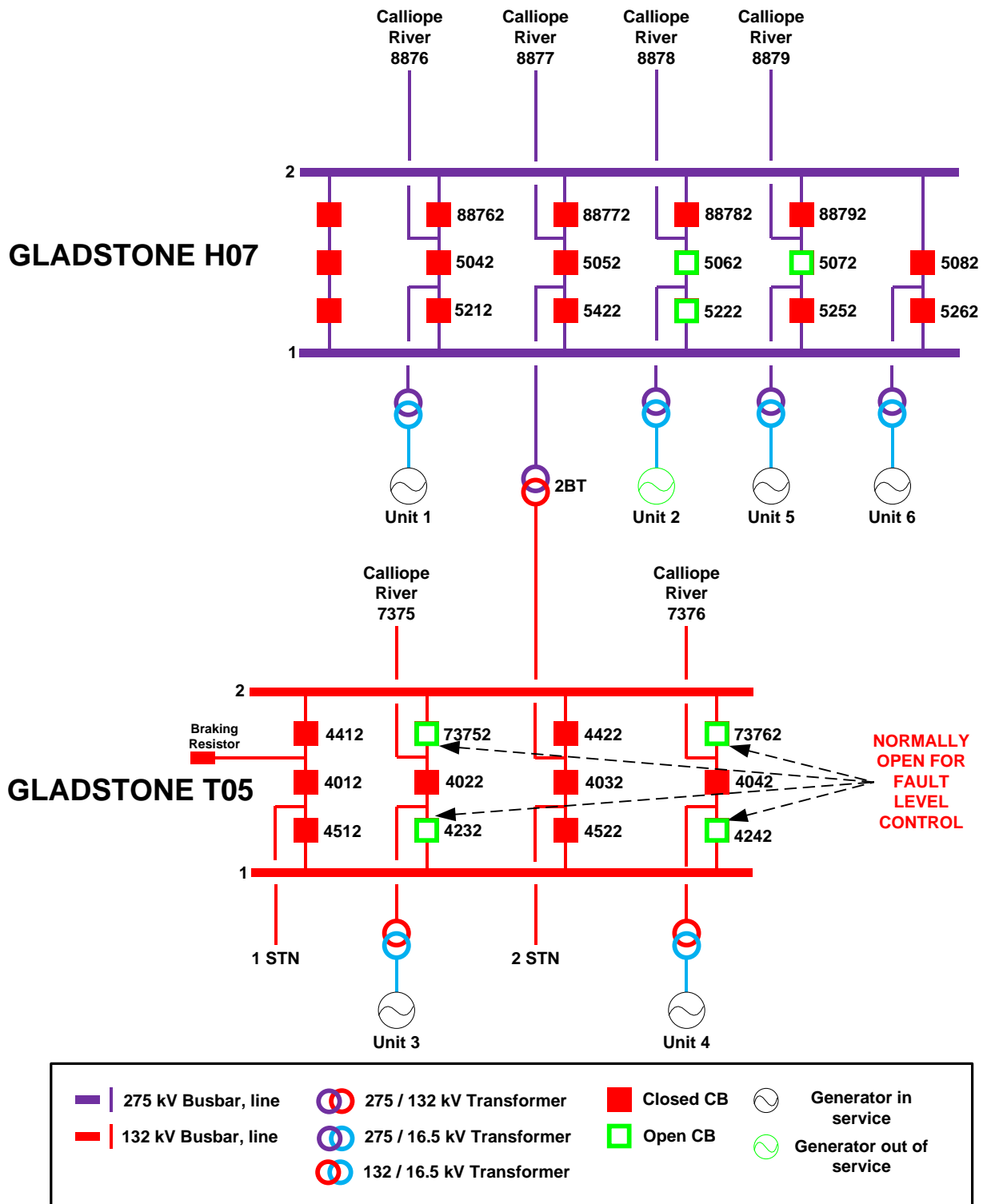
Table 1: Gladstone units generation prior to the incident

Generating Unit	MW
Gladstone 1	65
Gladstone 2	0
Gladstone 3	70
Gladstone 4	45
Gladstone 5	62
Gladstone 6	112

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



Gladstone Power Station Unit 2 had tripped at 1057 hrs on 27 January 2013 and was in the process of returning to service. Accordingly the 275 kV circuit breakers 5062 and 5222 were open prior to the event.

Gladstone Power Station Unit 5 was synchronised at 1606 hrs on 27 January 2013 and was in the process of stabilisation when the event occurred. Powerlink has informed AEMO that it is a normal practice at Gladstone Power Station to synchronise the units using only one CB initially and wait until the unit is stable to close the remaining CB. Accordingly the 275 kV CB 5072 was open prior to the event.

3 Summary of Events

At 1956 hrs on 27 January 2013, generating units 3, 4 and 5 at Gladstone Power Station tripped and unit 6 reduced its output. The total reduction of generation at Gladstone Power Station was approximately 290 MW.

The key events that took place during this incident are summarised in Table 2.

Table 2: Summary of events

Time	Events
19:56	Gladstone Power Station Unit 3 tripped from 70 MW (this off-loaded the Calliope River – Gladstone Power Station 7375 132 kV line) Gladstone Power Station Unit 4 tripped from 45 MW (this off-loaded the Calliope River – Gladstone Power Station 7376 132 kV line) Gladstone Power Station Unit 5 tripped from 62 MW Gladstone Power Station Unit 6 reduced from 112 MW to less than 5 MW within 2 minutes
20:15	Calliope River – Gladstone Power Station 7375 and 7376 132 kV lines returned to service.
20:24	Market Notice No.41266 issued informing about the multiple generation event.
20:56	Gladstone unit 6 commences increasing generation
23:32	Gladstone unit 4 returned to service
28/01/2013 08:30	Gladstone unit 3 returned to service
29/01/2013 08:30	Gladstone unit 5 returned to service

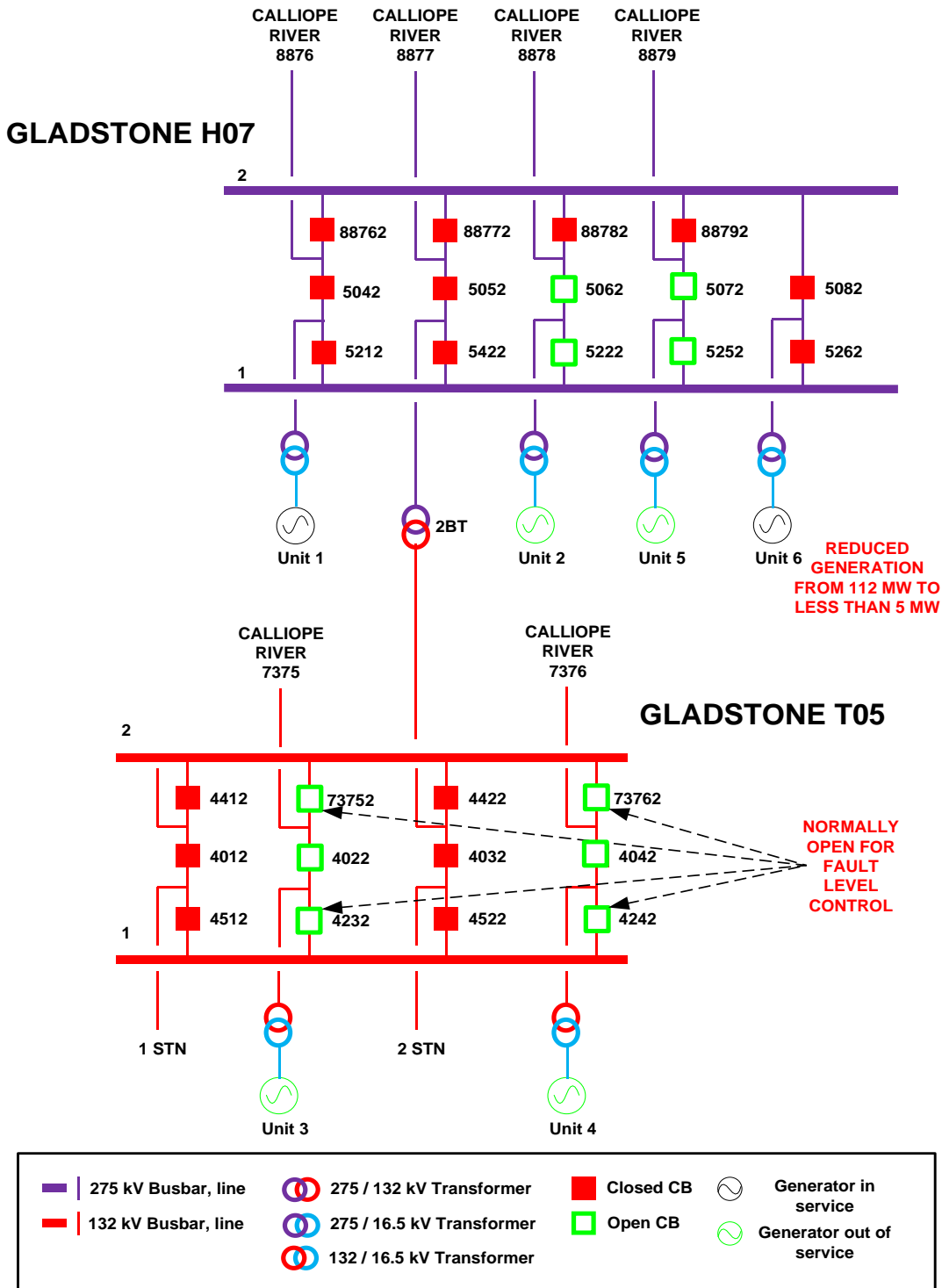
NRG Gladstone Operating Services has indicated that due to the wet conditions and saturation of the coal supplies to the power station, all in-service units at Gladstone Power Station were experiencing difficulties milling the coal, requiring auxiliary firing to maintain flame stability.

The weather conditions in the area prior to the event also affected deliveries of auxiliary fuel to the power station.

A reduced level of auxiliary fuel affected boiler firing stability on units 3, 4 and 5 causing them to trip and causing unit 6 to reduce output. Unit 1 was not affected by this event.

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 2024 hrs, AEMO issued Market Notice No.41266 informing of the non-credible contingency event involving multiple generating units. The cause was not known at the time.

At 0001 hrs on 28 January, the reason for the multiple trips was clearly identified as fuel related and considered unlikely of reoccurring; therefore AEMO did not reclassify this multiple contingency event as a credible contingency event.

5 Follow-up Actions

NRG Gladstone Operating Services has informed AEMO that after further investigations, it undertook and has completed a review of their existing wet weather operating procedures for extreme weather conditions.

In addition, NRG Gladstone Operating Services is reviewing plant alarms to increase auxiliary fuel igniter system reliability. Their target date for completion is 31 March 2013.

The incident investigation is being reviewed with all Gladstone Power Station Shift Operating Teams.

6 Power System Security Assessment

Several power stations reported an adverse impact of the wet weather conditions. AEMO, Powerlink and CS Energy were aware of the abnormal operating conditions at Gladstone Power Station and the increased chance of a single generating unit trip at the time. However the immediate risk of multiple generating unit trips was not identified by the Gladstone Power Station operator prior to the incident.

The Frequency Control Ancillary Service (FCAS) requirements dispatched at the time of the incident were enough to cater for the multiple generation loss. The power system was secure during this incident.

With the increased risk of generation tripping due to the wet conditions, AEMO, Powerlink and CS Energy discussed the situation, especially about reliability risk for Boyne Island load. Electrical analysis did not identify any issues in supplying the load. Still, contingency plans were considered and additional critical contingencies identified in case that the trip of the Gladstone Power Station units connected to the 132 kV network occurs.

No reserve issues were identified in the region even with the Gladstone Power Station units out of service and the reduced capacity of other units in the area. The wet conditions and the Australia Day long weekend caused the Queensland region demand to be lower than usual.

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.

AEMO correctly applied the criteria published in section 12 of its Power System Security Guidelines in assessing that the circumstances of this incident did not warrant reclassifying similar incidents as a credible contingency event.

7 Conclusions

Severe wet weather conditions in the area prior to the event affected the condition of the coal supplies to the station which required increased use of auxiliary fuel to maintain flame stability.

The tripping of units 3, 4 and 5 at Gladstone Power Station and the reduction of generation of unit 6 were due to reduced level of auxiliary fuel affecting boiler firing stability.

AEMO considered the abnormal operating conditions due to extreme weather and did not believe they would affect the security of the power system. However, the increased risk of simultaneous multiple generation trips was not evident prior to the incident.

NRG Gladstone Operating Services has reviewed their existing Gladstone Power Station wet weather operating procedures for extreme weather conditions

NRG Gladstone Operating Services is reviewing plant alarms to provide increased auxiliary fuel igniter system reliability.

The incident investigation is being reviewed with all Gladstone Power Station Shift Operating Teams, highlighting critical learning opportunities and observations.

The cause for the multiple trips was identified as fuel related and considered unlikely to reoccur. Therefore, AEMO correctly applied the criteria published in section 12 of its Power System Security Guidelines in assessing that the circumstances of this incident did not warrant reclassifying similar incidents as a credible contingency event.

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

NRG Gladstone Operating Services is to complete a review of plant alarms to provide increased auxiliary fuel igniter system reliability by 31 March 2013 and inform AEMO of the outcomes.