POWER SYSTEM OPERATING INCIDENT REPORT
REDBANK 132KV BUSBAR TRIP ON 25 APRIL 2011

PREPARED BY: Electricity System Operations Planning and Performance

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FINAL

Disclaimer

Purpose

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Abbreviations and Symbols

Abbreviation	Term
AEMO	Australian Energy Market Operator Ltd
CB	Circuit Breaker
EST	Eastern Standard Time
kV	kilovolt
MW	megawatt
MWh	megawatt hour (also MW·h)
NEM	National Electricity Market
NER	National Electricity Rules

1 Introduction

At 1723 hrs on 25 April 2011, protection systems of Redbank Power Station Unit No.1 in New South Wales operated to disconnect the generating unit from the power system. The circuit breaker (CB) of the generator transformer failed to open and the generating unit remained connected to the power system until backup protection systems operated to trip the Redbank 132kV busbar, disconnecting the Redbank generating unit from the power system. The Redbank generating unit was generating 71 MW at the time of disconnection. Both the 953 Redbank—Rothbury and the 955 Redbank—Singleton 132 kV lines opened at Redbank because of the busbar trip.

This report has been prepared under clause 4.8.15 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 Redbank Power and Ausgrid. Data from AEMO's Energy Management System has also been used in analysing the incident.

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

2 Pre-Contingent System Conditions

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.

The Redbank generating unit was generating 71 MW at the time and the 953 Redbank—Rothbury line was open at Rothbury, which is the normal operating arrangement.

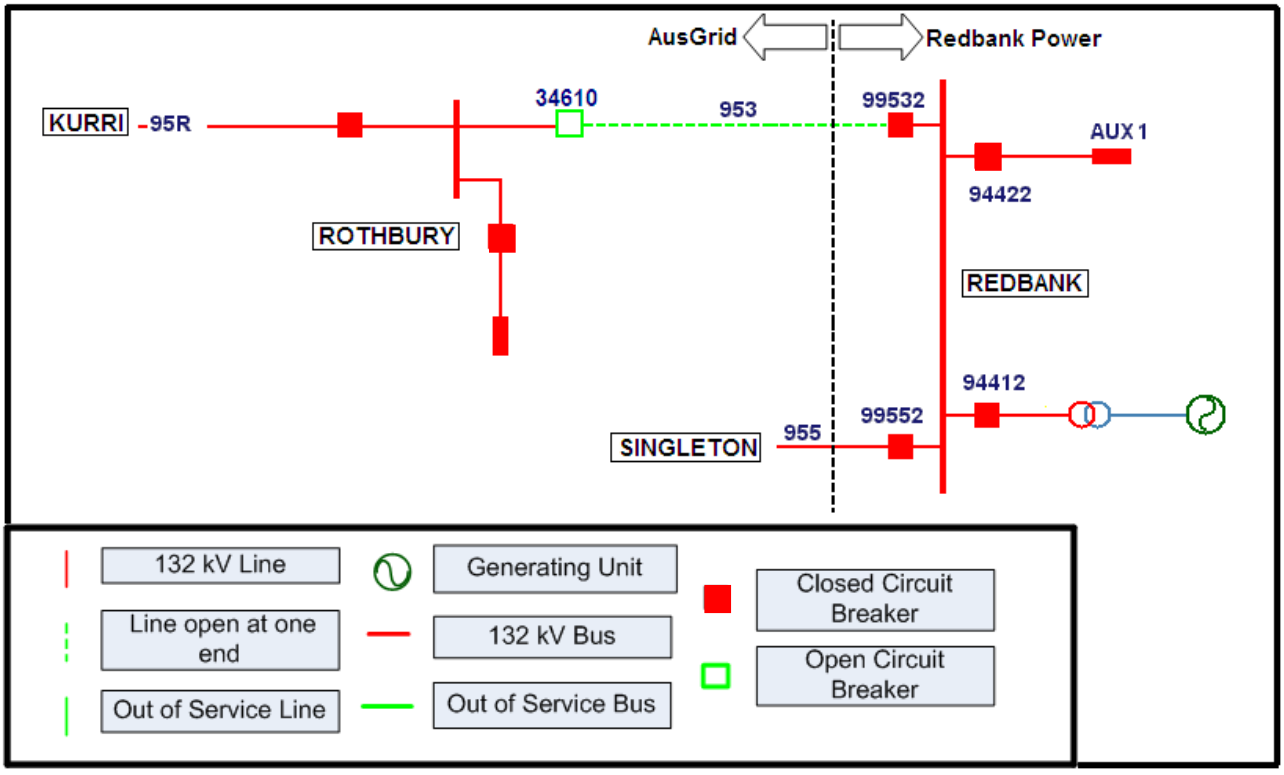

Figure 1 – Status of the power system prior to the incident

3 Summary of Events

At 1723 hrs on 25 April 2011, the Redbank generating unit protection system operated after detecting a fault in the generator excitation system. An excitation fault alarm was recorded at Redbank Power Station when the protection system operated. The operation of protections should have opened the generator transformer CB 94412 but this CB failed to open.

After 253 milliseconds, the CB failure protection operated as designed to trip the Redbank 132 kV busbar by opening CBs 99552, 94422, and 99532. As a consequence the following events took place:

- the Redbank generating unit tripped from 71 MW
- the auxiliary supplies to Redbank Power Station were interrupted
- the 955 Redbank—Singleton 132 kV line was off-loaded at Redbank
- the 953 Redbank—Rothbury 132 kV line was de-energised

A trip signal was also sent to generator transformer CB 94412 when CB failure protection operated but the CB failed to operate again.

The status of the power system and connections to Rothbury and Singleton immediately after the incident are shown in Figure 2.

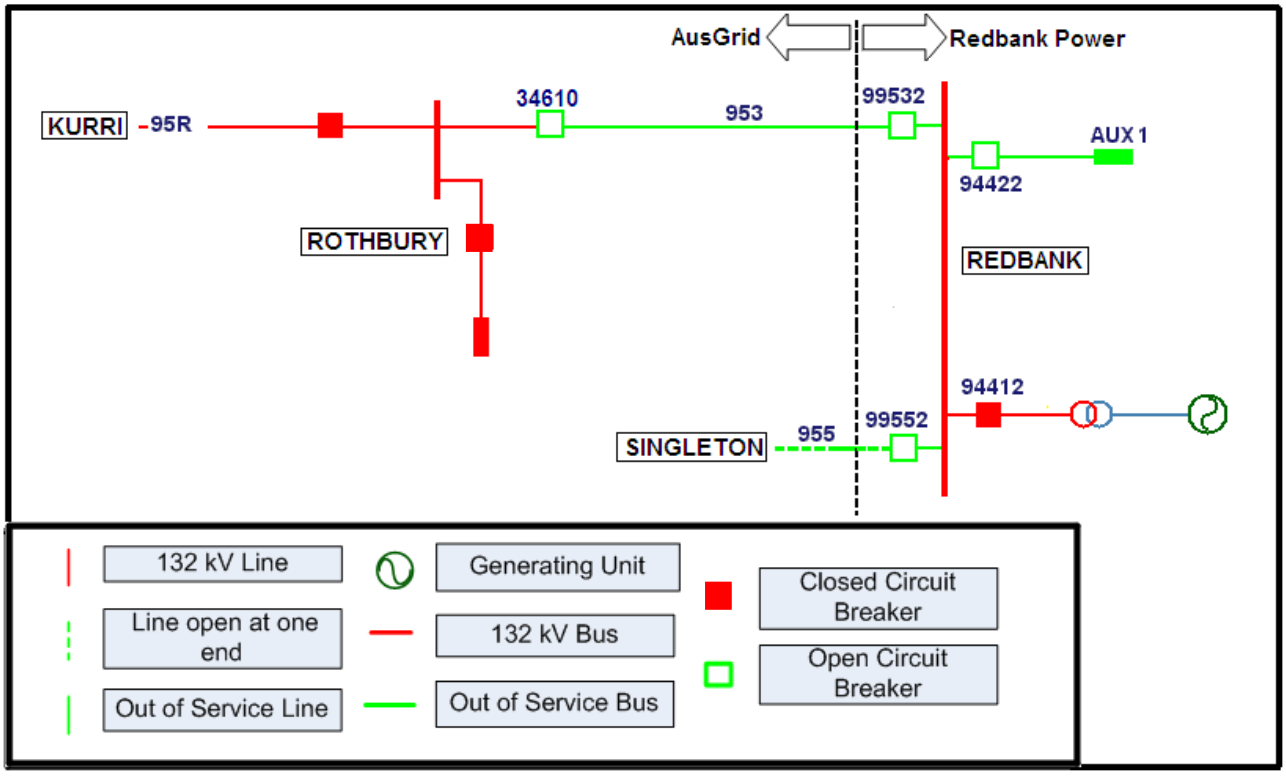

Figure 2 - Status of the power system immediately after the incident

4 Immediate Actions Taken

AEMO issued the Market Notice No. 35130 to notify participants of the occurrence of this non-credible contingency.

At 1727 hrs, Redbank Power manually opened the CB 94412.

Redbank Power undertook the following investigations immediately after the event:

- The excitation system was checked but there was no conclusive evidence of a fault.

- All the logs including high-speed chart recorder logs, generator logs, and switchyard logs were reviewed. These logs did not indicate evidence of a fault on the generating unit.

Redbank Power also investigated the operation of the generator transformer CB 94412.

- All terminals/ links and wiring in the relevant protection marshalling cubicle were checked and found to be in order.
- All wiring in the local CB marshalling cubicle was checked and found to be secure.
- All fuses were checked and found to be continuous.
- Operational trip checks were performed from Set 1 and Set 2 main protection trip relays and confirmed correct operation of the CB 94412.
- Open and close operations were successfully performed on the CB 94412, both remotely and locally.

At this point, Redbank Power concluded that there was most likely an intermittent fault on the generating unit.

After completion of this investigation, Redbank Power gave clearance for the generating unit to return to service. At 2031 hrs, CB 94422 was closed, restoring auxiliary supplies to the Redbank power station. At 2033 hrs, CBs 99552 and 99532 were closed returning 955 Redbank—Singleton 132 kV line to service and energising 953 Redbank—Rothbury 132 kV line from Redbank. At 0427 hrs on 26 April 2011, CB 94412 was closed and Redbank generating unit was returned to service.

5 Subsequent incident at Redbank

At 0506 hrs on 28 April 2011, the Redbank generating unit tripped again from 139 MW due to a fault in its excitation system. On this occasion, the generator transformer CB 94412 tripped as expected leaving the Redbank 132 kV busbar in service.

In the investigation of this second trip, Redbank Power identified an intermittent fault on an auxiliary contact in the generator excitation system. The auxiliary contact was found to open intermittently triggering operation of generator protections.

The auxiliary switch was replaced and the Redbank generating unit was returned to service at approximately 2300 hrs on the same day.

6 Power System Security Assessment

Redbank generating unit tripped from 71 MW as a result of the incident on 25 April 2011 and from 139 MW on 28 April 2011.

The power system voltages and frequencies remained within the normal operating bands during these events. The power system remained in a secure operating state during these events.

7 Conclusions

Redbank Power Station Unit 1 tripped on 25 and 28 April 2011 due to a faulty auxiliary switch that operated the generating unit excitation protection system. The generator transformer CB failed to open triggering the operation of circuit breaker failure protection. As a result, the Redbank Power Station 132 kV busbar tripped opening both the 953 Redbank—Rothbury and 955 Redbank—Singleton 132 kV lines at Redbank.

The reason for failure of generator transformer CB to operate has not been established.

8 Recommendations

Redbank Power will investigate the reason for failure of the generator transformer CB 94412 to operate on 25 April 2011 during the next scheduled outage of the generating unit. Redbank Power will inform the progress of this investigation to AEMO by the end of April 2012.