

# POWER SYSTEM INCIDENT REPORT

## TRIP OF SYDNEY NORTH 132 KV 'A' AND 'B' SECTION 1 BUSBARS ON 7 JULY 2010

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FINAL

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## 1. Introduction

At 04:57 hrs on 7 July 2010, the 132 kV 'A' and 'B' section 1 busbars at Sydney North 330 kV substation in New South Wales (NSW) region tripped and as a result the 132 kV lines from Sydney North to Mason Park, Homebush Bay, Kenthurst, Pennant Hills and Berowra were off-loaded. As a consequence of the incident, approximately 148 MW of customer load was interrupted in Pennant Hills, Hornsby and Berowra areas.

This report has been prepared under clause 4.8.15 of the National Electricity Rules to assess the adequacy of the provision and response of facilities and services and the appropriateness of actions taken to restore and maintain power system security.

Information for this report has been obtained largely from TransGrid, AEMO's Market Management System (MMS) and Energy Management System (EMS).

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

## 2. Summary of events

On Wednesday 7 July 2010 at 04:57 hrs, both 132 kV 'A' and 'B' section 1 busbars at Sydney North tripped and the following lines were off-loaded—see Figure 1:

- Sydney North to Kenthurst (221) 132 kV line
- Sydney North to Berowra (250) 132 kV line
- Sydney North to Pennant Hills (251) 132 kV line
- Sydney North to Mason Park tee Carlingford (926) 132 kV line
- Sydney North to Homebush Bay tee Carlingford (927) 132 kV line

The Sydney North to Galston (257) 132 kV line was out of service at the time of the incident. Before the busbar trip, approximately 148 MW of customer load in the areas of Pennant Hills, Hornsby and Berowra was supplied via No. 250 and No. 251 132 kV lines from Sydney North, and therefore the trip of these two lines caused an interruption of supply to these areas—see Figures 1 and 2. At 06:33 hrs, TransGrid attempted to restore supply via No. 250 line, however the line tripped at 06:48 hrs when approximately 24 MW load had been restored. The line was restored later at 08:53 hrs with modified protections. Its pilot wire protection was repaired and returned to service on 16 July 2010 at 11:23 hrs.

There was a momentary interruption of customer load at Kenthurst for approximately 17 secs before being restored by an auto-changeover of supply by Integral Energy systems. Supply to Mason Park and Homebush Bay was maintained through alternate supplies by Energy Australia. All loads interrupted in Pennant Hills, Hornsby and Berowra areas were restored by 09:30 hrs.

Due to fault level limitations, both Sydney North to Sydney East lines (92Z and 959) are operated normally open at Sydney North. However, these lines were closed at 07:58 hrs to reduce loading on the remaining 330/132 kV No. 3 and 4 transformers at Sydney North in the event of the next critical credible contingency. Fault levels remained within limits during this period due to the 330/132 kV No. 1 and 2 transformers being out of service.

To avoid possible post-contingent thermal overloading issues, Energy Australia recalled the Beaconsfield West to Chullora (91B) 132 kV line, which was out of service at the time, to reduce loading on the remaining Beaconsfield West to Chullora (91A, 91X and 91Y) 132 kV lines. The 91B line was closed at Beaconsfield West and Chullora at 09:30 hrs and 09:52 hrs respectively.

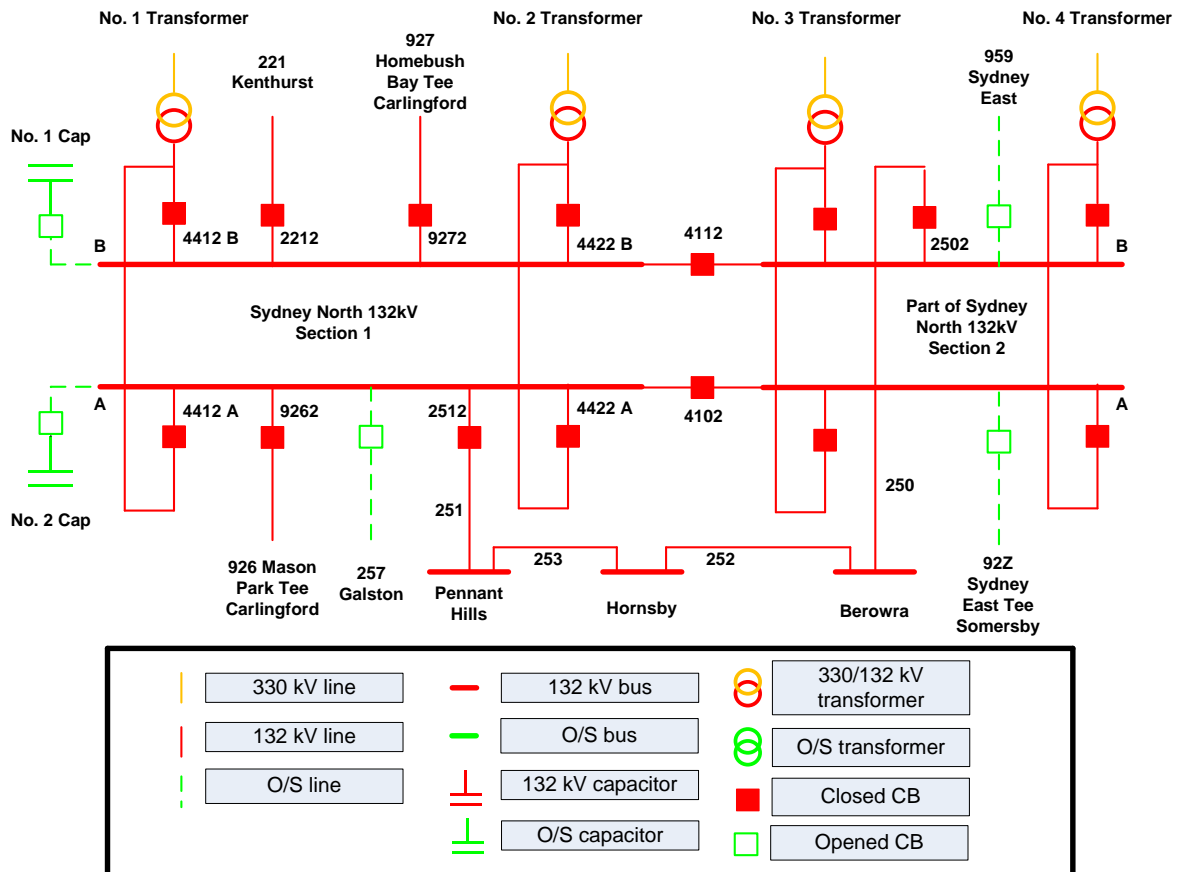


FIGURE 1. SYDNEY NORTH SUBSTATION BEFORE THE INCIDENT

All affected equipment was restored progressively as follows:

- The 132 kV 'A' section 1 busbar, No. 2 330/132 kV transformer, No. 2 132 kV capacitor bank and No. 251 line were returned to service on 7 July 2010 at 20:58 hrs.
- The No. 1 330/132 kV transformer was returned to service on 9 July 2010 at 20:16 hrs.
- The 132 kV 'B' section 1 busbar, No. 1 132 kV capacitor bank and No. 221 line were returned to service on 12 July 2010 at 19:39 hrs.
- No. 927 line was returned to service on 13 July 2010 at 18:02 hrs.
- No. 926 line was returned to service on 28 July 2010 at 19:24 hrs.

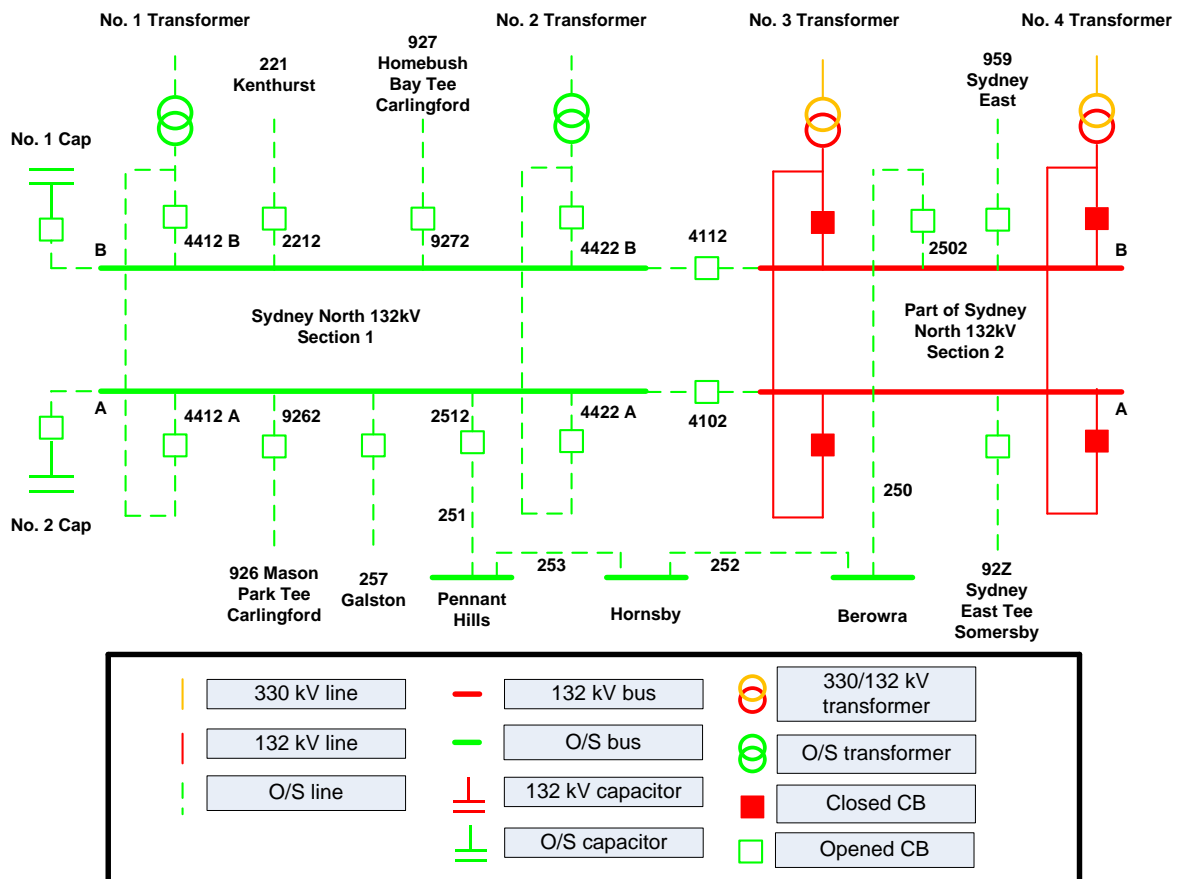


FIGURE 2. SYDNEY NORTH SUBSTATION AFTER THE INCIDENT

TransGrid investigations revealed that the busbar trip resulted from a fire in a cable trench that destroyed approximately 80 control and protection cables affecting services on the 132 kV 'A' and 'B' section 1 busbars. The likely cause of the fire was determined to be a high impedance fault in a low voltage AC supply cable. It is suspected that damage to the AC supply cable caused by rodents would have been the main cause of the fault.

The trip of No. 250 line was caused by an earth fault created by a pre-existing wiring defect in a termination box of a current transformer combined with stray earth currents caused by the cable trench fire.

### **3. Follow up action**

TransGrid is considering adoption of additional vermin control measures and changes to substation designs to limit impact of low voltage AC cable faults, in light of this incident.

### **4. Power System Security Assessment**

There were no power system security issues flagged in AEMO's real-time power system security monitoring applications. The power system frequency remained well within the frequency operating standard. All affected equipment was returned to service promptly after the incident.

### **5. Conclusions**

On 7 July 2010 at 04:57 hrs, a cable trench fire caused by a high impedance fault in a low voltage AC supply cable destroyed numerous control and protection cables affecting services on the Sydney North 132 kV 'A' and 'B' section 1 busbars. As a result, both busbars and several transmission elements tripped and interrupted 132 kV supplies to Pennant Hills, Hornsby and Berowra areas. Approximately 148 MW of customer load was interrupted. TransGrid is undertaking measures to prevent a recurrence of similar events in future.

### **6. Recommendations**

Nil.