

POWER SYSTEM INCIDENT REPORT

BRAEMAR VOLTAGE EXCEEDING SATISFACTORY LIMIT – 09 OCTOBER 2009

PREPARED BY: ESOPP

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DRAFT

1. INTRODUCTION

At 14:02 hrs on 9 October 2009, in an effort to increase the 11kV distribution network voltage, the Kogan Creek generator terminal voltage was raised from 21.2kV to 21.7kV. This resulted in the voltage measured on the 275kV bus at Braemar substation reaching 302kV and exceeding the satisfactory limit of 301kV for approximately 6 minutes.

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 or maintain power system security.

Information for this report has been provided by Powerlink and CS Energy. Additional information has been obtained from AEMO's Energy Management System and Market Management System.

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

2. SUMMARY OF EVENTS

The following sequence of events occurred during the incident on 9th October 2009:

At 14:01 hrs, the Kogan Creek generator terminal voltage (21kV system volts) was increased in an attempt to raise CS Energy's 11kV distribution network voltage which was low at the time due to extenuating circumstances.

Over a period of one minute, the generator terminal voltage was manually raised from 21.2kV to 21.7kV. Approximately 10 seconds later, the generator transformer tap changer began tapping automatically from tap '9' to its highest tap of '17' without Kogan Creek Operations staff being aware.

As a result of this tap changing, reactive power output from the Kogan Creek generating unit increased significantly from 55MVARs to approximately 370MVARs and voltage of the 275kV bus at Braemar substation increased to 302kV, exceeding its satisfactory limit. This condition existed for 6 minutes until corrective action was taken manually by CS Energy. Figure 1 and Figure 2 show the MVAR output of Kogan Creek generator and the voltage measured at 275kV busbar at Braemar substation.

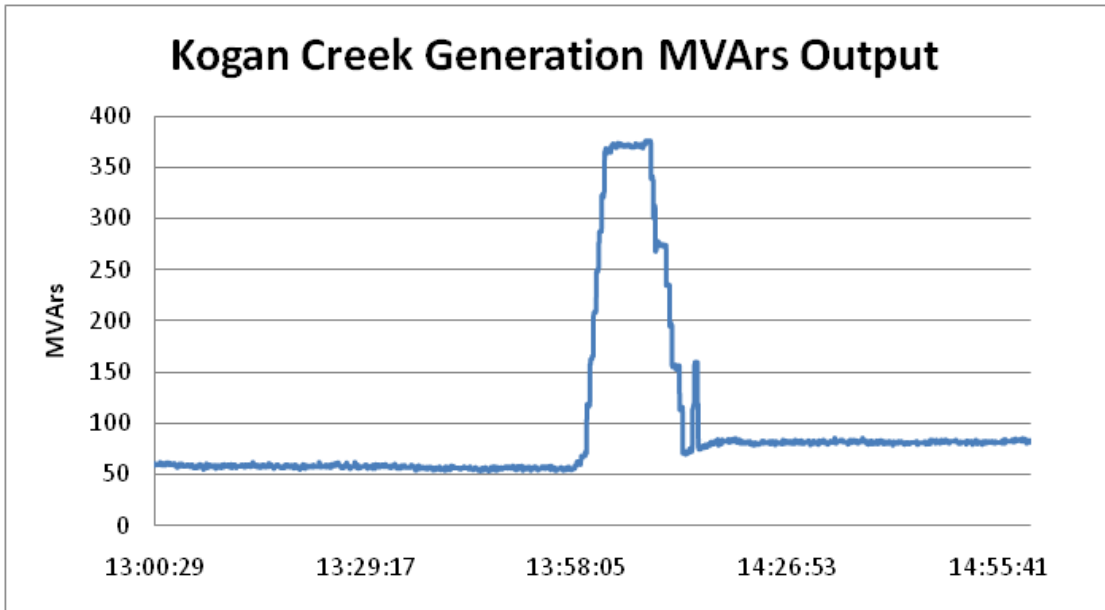


Figure 1: Kogan Creek Generation MVARs Output

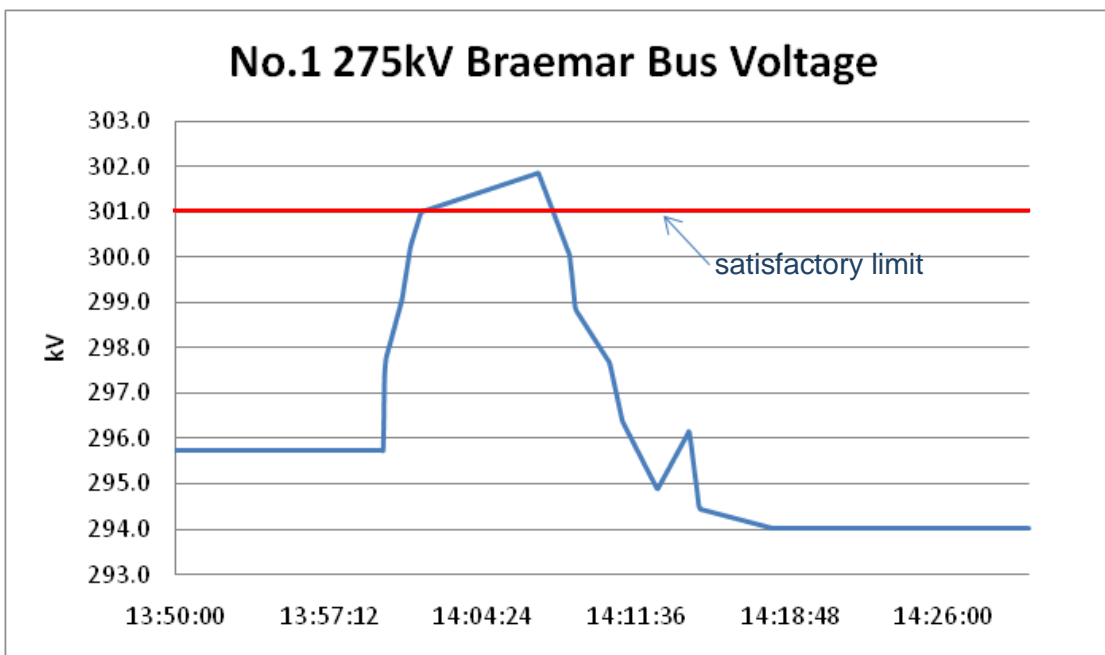


Figure 2: No.1 275kV Braemar Bus Voltage

AEMO requested Kogan Creek to tap down on the generator transformer. At the same time, requests were sent to Tarong, Braemar, and Millmerran units to lower their MVAR output.

First attempt to tap down the transformer was done remotely by Kogan Creek operations staff from the power station control room. This was unsuccessful. The tap changer was then switched to local control, allowing tap changes to be carried out manually.

After the tap changer was manually tapped down to tap '9', it was switched back to remote control. The tap changer started to automatically tap up again and the Kogan Creek Operations staff returned the tap changer to local control, tapped down to tap '9' and left the tap changer in local control mode.

3. ANALYSIS OF EVENTS

Investigation carried out by CS Energy found that the generator transformer tap changer controller¹ had been inadvertently left in local control mode. Thus, the tap changer controller ignored instructions from the power station control systems.

When the generator voltage was raised to 21.7kV, the tap changer controller, which was in 'Offline' mode at the time, attempted to lower the 21kV bus voltage as it would do when the Kogan Creek generating unit is off-line and receiving power from the grid. As the tap changer controller did not detect a lowering of the generator voltage, it continued to raise its tap.

4. FOLLOW UP ACTIONS

After the generator transformer tap changer controller settings were returned to normal (i.e. remote control), Kogan Creek operations staff successfully performed tap changing from the power station control room. Further tap-changing tests were performed remotely by AEMO to check its full functionality and this was also successful.

5. POWER SYSTEM SECURITY

The power system in the vicinity of Braemar 275kV substation deviated from the satisfactory operating state for a duration of six minutes due to the incident.

Power system frequency remained within the normal operating frequency band during the event.

No load or generator was interrupted as a consequence of the event.

6. CONCLUSIONS

The deviation from satisfactory operating state of 275kV Braemar busbar on 9 October 2009 was caused by the incorrect settings selected for Kogan Creek transformer tap changer controller due to human error.

This power system incident was efficiently managed by AEMO, CS Energy and Powerlink, in accordance with the Rules.

¹ Tap changer controller is the device that employs logic to manage the operation of the tap changer. This is separate from the tap changer motor drive unit, which is the mechanism to raise or lower the tap position according to the controller's commands.

7. RECOMMENDATION

CS Energy will implement a modification to the Kogan Creek Power Station control systems to initiate a discrepancy alarm whenever the generator transformer tap changer controller mode is different to the indication at the power station control room so that the Kogan Creek operations staff will be able to promptly investigate the discrepancy. This modification is expected to be complete by the end of April 2010.