AEMO
AUSTRALIAN ENERGY MARKET OPERATOR

Trip of Mount England – Wivenhoe 823 and 824 275 kV lines on 30 September 2020

January 2021

Reviewable Operating Incident Report under the National Electricity Rules

INCIDENT CLASSIFICATIONS

Classification	Detail
Time and date of Incident	1252 hrs on 30 September 2020
Region of incident	Queensland
Affected regions	Queensland
Event type	Human error
Generation impact	No generation was lost as a result of this incident.
Customer load impact	240 MW of dispatched load at Wivenhoe Power station was lost.
Associated reports	Nil

ABBREVIATIONS

Abbreviation	Term
AEMO	Australian Energy Market Operator
AEST	Australian Eastern Standard Time
Hz	Hertz
kV	Kilovolt
NEM	National Electricity Market
NER	National Electricity Rules
MW	Megawatt
V	Volt
WPS	Wivenhoe Power Station

Important notice

PURPOSE

AEMO has prepared this report in accordance with clause 4.8.15(c) of the National Electricity Rules, using information available as at the date of publication, unless otherwise specified.

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1. Overview

This report relates to a reviewable operating incident[1] that occurred on 30 September 2020 in Queensland. The incident involved the simultaneous trip of the Mount England – Wivenhoe 823 and 824 275 kilovolt (kV) lines (823 and 824 lines).

There was no loss of generation or customer load as a result of this incident. However, the Wivenhoe Power Station (WPS) No. 2 pump[2] was operating at approximately 240 megawatts (MW) immediately prior to the incident and tripped as a consequence of the loss of the 824 line.

As this was a reviewable operating incident, AEMO is required 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[3].

AEMO has concluded that:

1. The loss of the 823 and 824 lines was due to the loss of the 24 volt (V) control system supply at WPS.
2. The loss of the 24V control system supply was the result of human error when returning a battery charger to service.
3. CleanCo[4] has identified and implemented several remedial actions to prevent a recurrence of this type of event.
4. AEMO correctly reclassified the simultaneous loss of the 823 and 824 lines as a credible contingency after the incident.
5. The power system remained in a secure operating state during this incident.

This report is prepared in accordance with clause 4.8.15(c) of the National Electricity Rules (NER). It is based on information provided by CleanCo and AEMO.

National Electricity Market (NEM) time (Australian Eastern Standard Time [AEST]) is used in this report.

2. The incident

2.1 Pre-incident conditions

Immediately prior to this incident both 823 and 824 lines were in service and No. 2 pump at WPS was operating at approximately 240MW. CleanCo was also carrying out repair/replacement work on the WPS 24 V control system supplies. At the time only one of the two 24 V battery/charger systems was in service.

2.2 The incident

At 1252 hrs on 30 September 2020 the 823 and 824 lines tripped simultaneously, resulting in the loss of the No. 2 pump. There was no fault on the power system.

[1] See NER clause 4.8.15(a)(1)(i), as the event relates to a non-credible contingency event; and the AEMC Reliability Panel Guidelines for Identifying Reviewable Operating Incidents.

[2] WPS is a pumped storage hydro power station.

[3] See NER clause 4.8.15(b).

[4] The operator of the Wivenhoe Power Station.

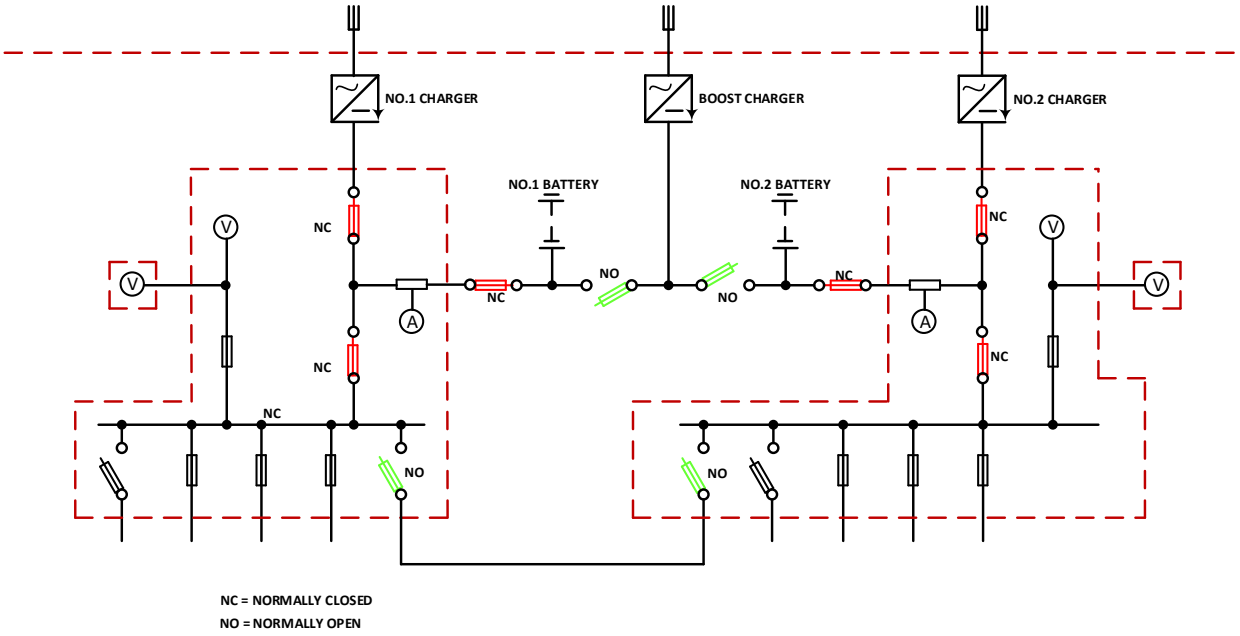
The 823 line was returned to service at 1342 hrs on 30 September 2020 and the 824 line was returned to service at 0945 hrs on 1 October 2020.

2.3 Analysis

The following is based on information provided by CleanCo.

This incident was caused by the loss of the 24 V control system supplies. The 24 V control system comprises two separate charger/battery systems with a spare or boost charger available to be connected to either of the systems as shown in Figure 1.

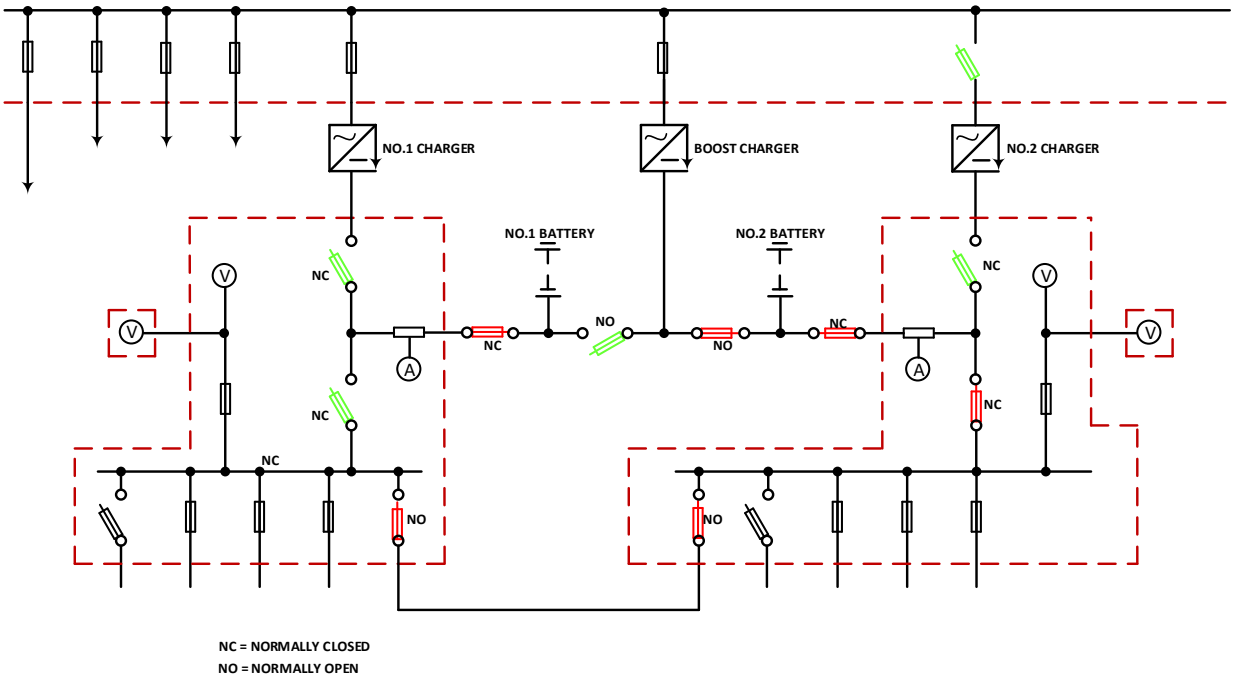
Figure 1 WPS 24V control system supplies (normal configuration)



On 16 September 2020 the No. 2 charger failed, and the boost charger was connected to the No. 2 battery to maintain supply to the No. 2 24 V busbar.

On 21 September 2020 the 24 V system was re-configured in preparation for repair works to the No. 2 charger and to replace the No. 1 battery. This involved isolating the No. 1 charger, No. 1 battery and No. 2 charger, and connecting the No. 1 and No. 2 busbars. In this configuration all 24 V supplies are maintained via the boost charger and No. 2 battery as shown in Figure 2.

Figure 2 WPS 24V control system supplies (outage configuration)



AEMO was not aware of this work and there was no requirement for CleanCo to advise AEMO unless the work resulted in an increased risk to the power system[5].

Although this was an unusual configuration for the 24 V control supply system, the in-service battery has an estimated holdup time of 19 hours based on the connected load and is tested annually to confirm this capacity. The in-service (boost) charger was being monitored and the No. 1 charger remained available for service if the boost charger failed. On this basis, the risk of complete failure of the 24 V supply was considered by CleanCo to be low, as it would require the simultaneous failure of both the boost charger and the No. 2 battery.

At approximately 1250 hrs on 30 September 2020 switching commenced to return the No. 2 charger to service. The work to replace the No. 1 battery was still in progress. During this switching process the boost charger and No. 2 battery were inadvertently disconnected before the No. 2 charger was returned to service. This resulted in the loss of all 24 V supply to the power station control systems which then correctly initiated an electrical fault shutdown of the station, with intertrips sent to Mount England to trip the 823 and 824 lines.

CleanCo has taken the following actions to prevent a recurrence of this type of incident;

- To reduce the complexity of managing isolations, work programs have been modified to eliminate parallel works. Works are now confined to replacement of a single item of plant at a time.
- The requirement that all switching/isolation operations must be conducted under a reviewed / approved switching program has been reinforced.
- CleanCo has reinforced to all Wivenhoe personnel the expectation that risk assessment procedures are to be used for hazard identification and management.

CleanCo will also undertake the following actions;

- Deliver additional guidance material on operational switching, assessment requirements, roles, accountability and reporting by 31 December 2020.

[5] Refer to clause 4.8.1 of the NER

- Deliver a targeted risk assessment refresher module in January 2021 to reinforce risk assessment applications including maintenance, operations, projects and management of change.
- The switching operator will complete refresher training and competency assessment by 31 December 2020 (including supervision and mentoring on future switching operations).

3. Power system security

AEMO is responsible for power system security in the NEM. This means AEMO is required to operate the power system in a secure operating state to the extent practicable and take all reasonable actions to return the power system to a secure state following a contingency event in accordance with the NER[6].

The power system remained in a secure operating state during this incident and no action was required from AEMO apart from invoking constraint sets Q-MEWV_823 and Q-MEWV_824 to ensure the Wivenhoe units did not receive dispatch targets while the lines were out of service. These constraint sets were revoked after the relevant lines had been returned to service.

3.1 Frequency

Immediately after the trip of 823 and 824 lines the frequency in the NEM rose to a maximum of approximately 50.18 hertz (Hz) and returned to below 50.15Hz within five seconds. The frequency operating standard was met in relation to this incident.

3.2 Reclassification

After the 824 line had been returned to service on 1 October 2020 AEMO assessed whether to reclassify the incident[7] as a credible contingency.

As CleanCo was not able to provide information as to the cause of the trip of both lines and was unable to confirm the incident was unlikely to reoccur AEMO reclassified the simultaneous loss of both 823 and 824 lines as a credible contingency from 0945 hrs on 1 October 2020. No constraint sets were invoked as part of this reclassification. The reclassification was cancelled at 1235 hrs on 2 October 2020 after CleanCo advised AEMO that the cause of the fault had been determined and that a reoccurrence was unlikely.

4. Market information

AEMO is required by the NER and operating procedures to inform the market about incidents as they progress. This section assesses how AEMO informed the market[8] over the course of this incident.

For this incident, AEMO informed the market on the following matters:

[6] Refer to AEMO's functions in section 49 of the National Electricity Law and the power system security principles in clause 4.2.6 of the NER.

[7] AEMO is required to assess whether to reclassify a non-credible contingency event as a credible contingency event – NER clause 4.2.3A(c) – and to report how the reclassification criteria were applied – NER clause 4.8.15(ca).

[8] AEMO generally informs the market about operating incidents as they progress by issuing Market Notices – see https://www.aemo.com.au/Market-Notices.

1. A non-credible contingency event – notify within two hours of the event[9].
   - AEMO issued Market Notice 78449 at 1316 hrs on 30 September 2020, 24 minutes after the event, to advise of the non-credible contingency event.
2. Reclassification, details, and cancellation of a non-credible contingency – notify as soon as practical[10].
   - AEMO issued Market Notice 78480 at 0945 hrs on 1 October 2020 to advise that AEMO had reclassified the incident as a credible contingency.
   - AEMO issued Market Notice 78496 at 1254 hrs on 2 October 2020 to advise that AEMO had cancelled the reclassification.

5. Conclusions

AEMO has assessed this incident in accordance with clause 4.8.15(b) of the NER. AEMO has assessed the adequacy of the provision and response of facilities or services, and the appropriateness of actions taken to restore or maintain power system security and has concluded that:

1. The loss of the 823 and 824 lines was due to the loss of the 24 volt (V) control system supply at WPS.
2. The loss of the 24V control system supply was the result of human error when returning a battery charger to service.
3. CleanCo[11] has identified and implemented several remedial actions to prevent a recurrence of this type of event.
4. AEMO correctly reclassified the simultaneous loss of the 823 and 824 lines as a credible contingency after the incident.
5. The power system remained in a secure operating state during this incident.

[9] AEMO is required to notify the market of a non-credible contingency event within two hours of the event – AEMO, Power System Security Guidelines, Section 7.3.

[10] AEMO is required to notify the market of a reclassification – NER clause 4.2.3(g), details of the reclassification – 4.2.3(c), and when AEMO cancels the reclassification – 4.2.3(h).

[11] The operator of the Wivenhoe Power Station.