|  |  |  |
| --- | --- | --- |
| contingent overload on morwell b3 transformer on 23 february 2015 | | |
|  | | |
| AN AEMO POWER SYSTEM OPERATING INCIDENT REPORT FOR THE NATIONAL ELECTRICTY MARKET | | |
| Published: **August 2015** |  |  |

VERSION RELEASE HISTORY

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| VERSION | DATE | BY | CHANGES | CHECKED BY | AUTHORISED BY |
| 1 | 13 August 2015 | R Kapoor | Final | J Lu | P Biddle |

INCIDENT CLASSIFICATIONS

|  |  |
| --- | --- |
|  |  |
| Time and date of incident | 2035 hrs Monday 23 February 2015 |
| Region of incident | Victoria |
| Affected regions | Victoria |
| Event type | Power system not secure for greater than 30 minutes |
| Primary cause | Procedural |
| Generation Impact | No generation was disconnected |
| Customer Load Impact | No customer load was disconnected |
| Associated reports | Nil |

ABBREVIATIONS

|  |  |
| --- | --- |
| Abbreviation | Term |
| AEMO | Australian Energy Market Operator |
| CA | Contingency Analysis |
| CB | Circuit Breaker |
| JLTS | Jeeralang Terminal Station |
| kV | Kilovolt |
| MW | Megawatt |
| NER | National Electricity Rules |
| HWPS | Hazelwood Power Station |
| HWTS | Hazelwood Terminal Station |
| MWTS B3 | Morwell Terminal Station No. 3 220/66 kV transformer |
| PD | Pre-dispatch |
| TOC | Transmission Operation Centre |
| YPS | Yallourn Power Station |

Important Notice

#### Purpose

AEMO has prepared this document to provide information about this particular Power System Operating Incident.

#### Disclaimer

This document or the information in it may be subsequently updated or amended. This document does not constitute legal or business advice, and should not be relied on as a substitute for obtaining detailed advice about the National Electricity Law, the National Electricity Rules, or any other applicable laws, procedures or policies. AEMO has made every effort to ensure the quality of the information in this document but cannot guarantee its accuracy or completeness.

Accordingly, to the maximum extent permitted by law, AEMO and its officers, employees and consultants involved in the preparation of this document:

* make no representation or warranty, express or implied, as to the currency, accuracy, reliability or completeness of the information in this document; and
* are not liable (whether by reason of negligence or otherwise) for any statements or representations in this document, or any omissions from it, or for any use or reliance on the information in it.

Copyright 2014. Australian Energy Market Operator Limited. The material in this publication may be used in accordance with the copyright permissions on AEMO’s website.

# OVERVIEW

This report reviews a power system operating incident on Monday 23 February 2015 in Victoria where the power system was operated in a non-secure state for 40 minutes. The incident involved the potential post contingent overload[[1]](#footnote-1) of Morwell Terminal Station No. 3 220/66 kV transformer (MWTS B3). The post contingent overload could have occurred as a result of:

* the loss of the Hazelwood Power Station (HWPS) to Jeeralang Terminal Station (JLTS) (HWPS – JLTS) No.4 220 kV line,
* during a planned outage of HWPS to Hazelwood Terminal Station (HWTS) No.4 220 kV line­­­­ (HWPS – HWTS No.4 Line) No.4 Busbar Circuit Breaker (CB) at HWPS,
* whilst HWPS Unit No.6 CBs at HWPS were open.

Under the National Electricity Rules (NER) [[2]](#footnote-2), AEMO is required to assess power system security over the course of this incident because the power system was in a non-secure operating state for longer than 30 minutes. Specifically, 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]](#footnote-3)

No load or generation was lost as a result of this incident.

AEMO concluded that the actions taken were not appropriate to restore the power system to a secure operating state within 30 minutes as required. To prevent this from happening again, AEMO has revised its processes associated with outage assessment and switching of Yallourn unit 1.

This report is based on the investigation undertaken by AEMO. National Electricity Market time (Australian Eastern Standard Time) is used in this report.

# the incident

On 23 February 2015, there was a planned outage of the HWPS – HWTS No.4 220 kV line No.4 busbar CB at HWPS. This left two bus tie connections between HWPS 220 kV busses No. 3 and No. 4.

At 2033 hrs, HWPS Unit 6 was removed from service, as part of a planned generator outage, and its associated circuit breakers at HWPS were opened. This left only one bus tie connection between No. 3 and No. 4 220 kV busses at HWPS.

At 2035 hrs, AEMO’s Contingency Analysis tool indicated a post contingent overload of the MWTS B3 transformer for the trip of the HWPS – JLTS No. 4 220 kV line. This meant the power system was in a non-secure operating state.

The post contingent overload cleared at 2115 hrs after AEMO invoked a constraint to restrict generation dispatch of Unit 1 at Yallourn Power Station (YPS W1).

No load or generation was lost as a result of this incident.

See Appendix 1 for system diagrams illustrating the incident, and Appendix 2 for a chronological log of the events comprising the incident.

# aemo investigation

AEMO investigated the incident and found two separate events that collectively resulted in the power system being in a non-secure operating state for 40 minutes.

* No prior contingency planning was in place to manage potential power system security issues arising from the planned outages.The potential impacts on power system security resulting from the decommitment of HWPS No. 6 unit were not foreseen by AEMO despite having the planned outage reflected in Pre-Dispatch. At 2032 hrs, AEMO had also received a telephone call from GDF Suez confirming the start time of the planned outage of HWPS Unit 6.
* At the time of the event (2035 hrs), YPS W1 was generating 360 MW and was connected to the 500 kV network[[4]](#footnote-4). To return the system to a secure operating state, AEMO developed a plan to reduce YPS W1 generation output and switch YPS W1 unit to the 220KV network. AEMO then did not invoke a constraint to limit YPS W1 generation within an acceptable timeframe following identification of the potential overload on the MWTS B3 transformer. This extended the time taken to reduce YPS W1 generation output and switch to the 220KV mode.

# power system security

This section assesses how power system security was managed over the course of the incident[[5]](#footnote-5).

At 2035 hrs, AEMO identified the post contingency overloading of MWTS B3 transformer for the trip of the HWPS – JLTS No. 4 220 kV line.

AEMO discussed possible network re-configuration and re-rating options with AusNet Services. Switching YPS W1 from 500 kV operating mode to 220 kV mode was identified as the most viable option.

At 2045 hrs AEMO requested AusNet to arrange for YPS W1 to be switched to the 220 kV mode in accordance with agreed procedures. Subsequently AEMO has identified that this procedure relates to planned outages; and the procedure did not consider the limited timeframes required to restore the power system to a secure state during unplanned outages.

At 2110 hrs, AEMO invoked constraint set #YWPS1\_E to constrain YPS W1 to 217 MW in preparation for switching to the 220KV mode.

At 2115 hrs, YPS W1 output had reduced to 217 MW and was switched to the 220 kV mode. This removed the post contingent overload on MWTS B3 transformer, and restored the power system to a secure operating state.

AEMO has established that if constraint set #YWPS1\_E was invoked as soon the CA violation was identified, the power system would have returned to a secure operating state within 30 minutes.

AEMO has revised its procedures for managing unplanned outages that require switching from the 500 kV mode to the 220 kV mode. The revised procedure now specifies the requirement for AEMO to apply a constraint on YPS W1 when switching to the 220 kV mode.

AEMO has also revised its outage assessment procedure for similar outages at HWPS to ensure adequate planning to cater for planned generating unit commitment/decommitment.

# conclusions

AEMO concluded that the power system was in a non-secure operating state for greater than 30 minutes due to:

* Lack of situational awareness of the potential impact on power system security due to HWPS 6 unit’s decommitment. To prevent this incident from re-occurring for similar outages, AEMO has reviewed and revised the outage assessment process.
* The delay in invoking a constraint to restrict YPS W1’s output to remove the contingent overload on MWTS B3 transformer. AEMO has revised its procedure for unplanned outages that require switching of YPS W1 unit from the 500 kV to the 220 kV mode.

1. – power system diagram

#### The power system before the incident



#### The power system during the incident



1. – incident event log

#### Incident Log

|  |  |
| --- | --- |
| Time/23 Feb 2015 | Event |
| 2033 hrs | Scheduled outage of Hazelwood Unit 6 as per Pre-dispatch |
| 2035 hrs | Post contingent violations of Morwell B3 transformer (up to 158% of Loadshed rating 217 MVA) for the contingent loss of Hazelwood – Jeeralang No. 4 220 kV Line |
| 2045 hrs | AusNet’s Transmission Operation Centre (TOC) requested to switch YPS unit W1 to 220 kV mode |
| 2055 hrs | Advised by AusNet’s TOC that YPS W1 is reducing to 200 MW to enable the switch to 220 KV mode |
| 2110 hrs | constraint #YWPS1\_E invoked constraining YPS W1 to 217 MW. YPS W1 was advised to follow new dispatch target set by the quick constraint. |
| 2115 hrs | YPS W1 reduced output to 217 MW and switched to the 220 kV mode. Power system returned to a secure state. |
| 2130 hrs | Constraint revoked #YWPS1\_E at 2130 hrs. YPS was advised. |

1. The overload would occur if the credible contingency occurred. [↑](#footnote-ref-1)
2. Clause 4.8.15(a)(1)(iv) and AEMC Reliability Panel Guidelines for Identifying Reviewable Operating Incidents. [↑](#footnote-ref-2)
3. NER Clause 4.8.15 (b) [↑](#footnote-ref-3)
4. Switching arrangements are in place to allow YPS W1 to be connected to either the 500KV or 220 kV mode. YPS W1 needs to reduce its output to allow switching from the 500 kV mode to the 220 kV mode. [↑](#footnote-ref-4)
5. AEMO is responsible for power system security in the NEM and is required to operate the power system in a secure operating state (NER Clause 4.2.4 (a)). AEMO must thereby ensure that the power system is maintained in, or returned to, a secure operating state following a contingency event. [↑](#footnote-ref-5)