

---

# Trip of the Vales Point Generator 330 kV bus and No. 1 Transformer, 6 January 2020

---

**July 2020**

Reviewable Operating Incident Report under the  
National Electricity Rules

---

## INCIDENT CLASSIFICATIONS

Classification	Detail
Time and date of Incident	2207 hrs on 6 January 2020
Region of incident	New South Wales
Affected regions	New South Wales
Event type	Environmental
Generation impact	No
Customer load impact	10 MW of customer load was disconnected as a result of this incident.
Associated reports	Nil

## ABBREVIATIONS

Abbreviation	Term
AEMC	Australian Energy Market Commission
AEMO	Australian Energy Market Operator
AEST	Australian Eastern Standard Time
CB	Circuit Breaker
kV	Kilovolt
MW	Megawatts
NEM	National Electricity Market
NER	National Electricity Rules
PSSWG	Power System Security Working Group
TNSP	Transmission Network Service Provider

# 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.

## **DISCLAIMER**

AEMO has made every reasonable effort to ensure the quality of the information in this report but cannot guarantee its accuracy or completeness. Any views expressed in this report may be based on information given to AEMO by other persons.

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

- 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**

© 2020 Australian Energy Market Operator Limited. The material in this publication may be used in accordance with the copyright permissions on AEMO's website.

# Contents

<b>1.</b>	<b>Overview</b>	<b>5</b>
<b>2.</b>	<b>The incident</b>	<b>5</b>
2.1	Pre-incident conditions	5
2.2	The incident	5
2.3	Analysis	6
<b>3.</b>	<b>Power system security</b>	<b>7</b>
3.1	Reclassification	7
<b>4.</b>	<b>Market information</b>	<b>7</b>
<b>5.</b>	<b>Conclusions</b>	<b>8</b>
<b>A1.</b>	<b>Sequence of events</b>	<b>9</b>
<b>A2.</b>	<b>System diagrams</b>	<b>10</b>
<b>A3.</b>	<b>System load trend</b>	<b>14</b>

# Tables

Table 1	Sequence of events for Vales Point Trip event and recovery, 6-7 January 2020	9
---------	--	---

# Figures

Figure 1	Pre-incident conditions, Vales Point	10
Figure 2	Pre-incident conditions, Lake Munmorah	11
Figure 3	Post-incident conditions, Vales Point	12
Figure 4	Post-incident conditions, Lake Munmorah	13
Figure 5	Real power trend for Vales Point 95T and Munmorah 97U feeder throughout incident and recovery	14

# 1. Overview

This report relates to a reviewable operating incident<sup>1</sup> that occurred on 6 January 2020 in New South Wales. The incident involved the simultaneous trip of the Vales Point Generator 330 kilovolt (kV) bus and the Vales Point No. 1 330/132 kV Transformer.

There was no loss of generation as a result of this incident. 10 megawatts (MW) of customer load at Lake Munmorah was temporarily lost when the feed to AusGrid's Lake Munmorah Substation was tripped.

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<sup>2</sup>.

AEMO has concluded that:

1. The trip of the Vales Point Generator 330 kV bus and the Vales Point No. 1 330/132 kV Transformer was due to an external flashover on an isolator.
2. All protection systems operated as designed and as expected to clear the fault.
3. The probable cause of the flashover on the isolator was a build-up of foreign particulates on an insulator followed by light rain creating an external path for electrical flashover.
4. The power system remained in a secure operating state throughout 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 TransGrid<sup>3</sup> 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

Prior to this incident, major bushfires in the Wollemi National Park, to the west of Vales Point, had increased atmospheric pollution in the area. This resulted in increased particulate pollution, in addition to the normal background pollution from the salt-laden air and the nearby coal power station and water treatment system.

Lake Munmorah substation was being supplied from Vales Point via the 95T line, which is the normal supply arrangement.

### 2.2 The incident

At 2207 hrs on 6 January 2020, the Vales Point Generator 330 kV bus and the Vales Point No. 1 330/132 kV Transformer tripped due to protection operation. This resulted in the opening of all the circuit breakers associated with the Vales Point Generator 330 kV bus and No. 1 Transformer. The Vales Point Main 330 kV bus remained in service to provide connection and supply for Vales Point Power Station.

---

<sup>1</sup> 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.

<sup>2</sup> See NER clause 4.8.15(b).

<sup>3</sup> TransGrid is the Transmission Network Service Provider (TNSP) for New South Wales.

High voltage (HV) isolations were put in place around the impacted equipment on the morning of 7 January 2020. After equipment repairs on the same day, the site returned to service at 1558 hrs on 7 January 2020.

## 2.3 Analysis

The following is based on information provided by TransGrid.

At 2207 hrs on 6 January 2020, the Vales Point Generator 330 kV bus and No. 1 330/132 kV Transformer tripped. The No. 3 132/6.6 kV Station Auxiliary Transformer and Lake Munmorah 95 T 132 kV line tripped at the same time, resulting in a temporary load loss of approximately 10 MW until 97J line closed automatically at Lake Munmorah to restore supply from the Munmorah 132 kV substation.

Review of the data logs by TransGrid confirmed that all protections operated as intended.

A sequence of events is provided in Appendix A1, with pre- and post-incident network configurations at Vales Point and Munmorah are provided in Appendix A2.

HV isolations were applied<sup>4</sup> around the Vales Point Generator 330 kV bus by TransGrid personnel immediately after the incident and on the following morning (7 January 2020). Inspection by TransGrid personnel identified visible signs of arcing flashover on the Vales Point No. 1 Capacitor Disconnecter (5713). Based on the evidence, TransGrid determined that the isolator insulating post likely flashed over to the arcing rod, in turn triggering the protection to operate as designed. The No. 1 Capacitor Circuit Breaker (CB) (5712) was out of service at the time of the incident, and no damage was found on the CB or the No. 1 Capacitor.

Disconnecter 5713 was noted to be visibly dirty. There had been significant atmospheric pollution in the area prior to the incident, due to the combination of coal power station operation, salt air, and bushfires to the west as detailed in Section 2.1. TransGrid reports noted that it was raining in the immediate area at the time of the incident<sup>5</sup>.

Insulators are normally inspected as part of the quarterly routine substation inspections, with excessively dirty insulators flagged for washdown. The most recent inspection had not flagged the 5713 disconnecter. The insulators used at the site are High Pollution type that do not normally require washdown, provided there has been regular rainfall at the site<sup>6</sup>. In this specific instance, TransGrid noted that there had been an extended dry period followed by increased pollution levels from the bushfires, leading to a build-up of pollution on the insulator.

TransGrid investigations stated the probable root cause of the flashover was build-up of pollution in the air settling on the isolator. As the light rain began, this likely created an external path for flashover from the isolator insulating post to the arcing rod, resulting in the subsequent Vales Point Generator 330 kV bus and No. 1 330/132 kV Transformer trip.

The disconnecter had also been installed with the minimum design rod gap. TransGrid's review determined that this, while correct, was less than the other rod gap settings on site. TransGrid has since adjusted all disconnectors on the busbar to the same rod gap setting, which exceeds the minimum.

The isolator was repaired by TransGrid and the site returned to service late on 7 January 2020. The first re-energisation was at 1558 hrs, with the remaining circuit breakers returned to service over the following 10 minutes. See Appendix A1 for specific sequence of events data.

### 2.3.1 Impact on customer load

AEMO records for 6 January 2020, following the tripping of the Vales Point Generator 330 kV bus and No. 1 330/132 kV Transformer, show a temporary loss of approximately 10 MW of load from Lake Munmorah before alternate line 97J was auto-closed at Lake Munmorah substation. Pre- and post-incident network

---

<sup>4</sup> Circuit breakers at required isolation points were either already opened or had been tripped by protection functions during the event, but include CBs 5712, 5252, 5262, 222G, 242G and CB 5412.

<sup>5</sup> The Bureau of Meteorology recorded between 2 mm and 5 mm of rainfall in the area between 6 and 7 January 2020.

<sup>6</sup> Greater than 20 mm in a 24-hour period within the previous six months.

configurations at Lake Munmorah are provided in Appendix A2. A trend of real power on the lines supplying Lake Munmorah before and after the incident is provided in Appendix A3.

## 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<sup>7</sup>.

The power system was in a secure operating state throughout this incident. No action was required by AEMO in relation to power system security.

### 3.1 Reclassification

AEMO assessed whether to reclassify this incident as a credible contingency event<sup>8</sup>.

TransGrid advised that the Auxiliary transformer (T3) would not be back-energised until a daylight inspection was conducted. As it was unclear at the time if both Vales Point Units 5 and 6 were being supplied from the Station Auxiliary transformer, AEMO determined that simultaneous loss of multiple generating units at Vales Point Power Station could occur and correctly reclassified this as a credible contingency from 0027 hrs on 7 January 2020.

This reclassification was cancelled at 1900 hrs on 7 January 2020, after the Vales Point Shift Manager advised AEMO that Vales Point Units 5 and 6 were being supplied from separate auxiliary transformers, such that a single failure would not result in the tripping of multiple generating units.

AEMO also reviewed the bushfire classification processes at the Power System Security Working Group (PSSWG) meeting on 7 February 2020, with no change recommended. Due to the number of variables involved in reliably identifying the risks associated with pollution and other indirect impacts of bushfires, asset owners were deemed to be best placed to identify and advise AEMO of any abnormal conditions.

## 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<sup>9</sup> over the course of this incident.

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

1. A non-credible contingency event – notify within two hours of the event<sup>10</sup>.
  - AEMO issued Market Notice 72374 at 2240 hrs on 7 January 2020, 33 minutes after the event, to advise of the non-credible contingency event.

---

<sup>7</sup> 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.

<sup>8</sup> AEMO is required to assess whether or not 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).

<sup>9</sup> AEMO generally informs the market about operating incidents as the progress by issuing Market Notices – see <https://www.aemo.com.au/Market-Notices>.

<sup>10</sup> 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.

2. Reclassification, details, and cancellation of a non-credible contingency – notify as soon as practical.
  - AEMO issued Market Notice 72375 at 2249 hrs on 6 January 2020, 42 minutes after the event, to advise it had invoked constraint set F-I\_TG\_1000 and declared a variation to FCAS Raise requirement.
  - AEMO issued Market Notice 72377 at 0027 hrs on 7 January 2020, to advise that AEMO had reclassified the incident as a credible contingency.
  - AEMO issued Market Notice 72391 at 0734 hrs on 7 January 2020, to advise that AEMO had revoked the constraint set and removed the variation to FCAS Raise requirement.
  - AEMO issued Market Notice 72392 at 0747 hrs on 7 January 2020, to advise that AEMO had cancelled the reclassification of the incident as a credible contingency.

## 5. Conclusions

AEMO has assessed this incident in accordance with clause 4.8.15(b) of the NER. In particular, 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.

AEMO has concluded that:

1. The trip of the Vales Point Generator 330 kV bus and the Vales Point No.1 330/132 kV Transformer was due to an external flashover on an isolator.
2. All protection systems operated as designed and as expected to clear the fault.
3. The probable cause of the flashover on the isolator was a build-up of foreign particulates on an insulator followed by light rain creating an external path for electrical flashover.
4. The power system remained in a secure operating state throughout this incident.



# A1. Sequence of events

**Table 1** Sequence of events for Vales Point Trip event and recovery, 6-7 January 2020

Time	Description
<b>6 January 2020</b>	
2207 hrs	Vales Point Generator 330 kV Bus and No. 1 Transformer tripped, including: <ul style="list-style-type: none"> <li>• No. 1 330/132 kV Transformer CB (5412);</li> <li>• Sydney North CB (222G);</li> <li>• Eraring CB (242G);</li> <li>• No. 5 Gen CB (5252);</li> <li>• No. 6 Gen CB (6262).</li> </ul> No. 3 132/6.6 kV Station Aux Transformer CB (4932) tripped. Lake Munmorah 132 kV CB (95T2) tripped. Load auto-closed on to alternate supply at Lake Munmorah.
2230 hrs	Vales Point Unit controller advised both Units 5 and 6 auxiliaries supplied from No. 4 132/6.6 kV Station Aux Transformer.
2240 hrs	Market Notice 72374 issued – Non-credible contingency event – New South Wales region.
2245 hrs	Trip of Vales Point Units 5 and 6 reclassified as a credible contingency.
2249 hrs	Market Notice 72375 issued – Variation to FCAS Raise requirement.
<b>7 January 2020</b>	
0027 hrs	Market Notice 72377 issued – Reclassification of a non-credible contingency event: Loss of multiple generating units New South Wales region.
0101 hrs	TransGrid advised cause of the fault on Vales Point Generator 330 kV Bus was insulator flashover. Bus to be isolated and insulators washed same day.
0715 hrs	Vales Point Shift Manager advised only Unit 6 auxiliaries supplied from station supply. Unit 5 was being supplied from the unit aux supply
0720 hrs	Reclassification for multiple trip Vales Point Units 5 and 6 cancelled.
0734 hrs	MN 72391 issued. Cancellation – Variation to FCAS Raise requirement.
0747 hrs	MN 72392 issued. Cancellation – Reclassification of a non-credible contingency event: Loss of multiple generating units New South Wales region.
1558 hrs	Vales Point Generator 330 kV Bus Sydney North CB (222G) closed.
1559 hrs	Vales Point Generator 330 kV Bus Eraring CB (242G) closed.
1603 hrs	Vales Point Generator 330 kV Bus No. 6 Gen CB (6262) closed.
1605 hrs	MN 72397 issued – Update – Non-credible contingency event – New South Wales region.
1606 hrs	Vales Point Generator 330 kV Bus No. 5 Gen CB (5252) closed.
1608 hrs	Vales Point Generator 330 kV Bus No. 1 330/132 kV Transformer CB (5412) closed.
1609 hrs	Vales Point Generator 330 kV Bus No. 3 132/6.6 kV Station Aux Transformer CB (4932) closed.
1610 hrs	TransGrid Vales Point Generator 330 kV Bus and Vales Point No. 1 330 /132 kV Transformer returned to service. TransGrid advise a recurrence of this contingency is unlikely to recur.

# A2. System diagrams

The diagrams below provide an overview of part of the power system at Vales Point and Lake Munmorah immediately prior to the incident.

Figure 1 Pre-incident conditions, Vales Point

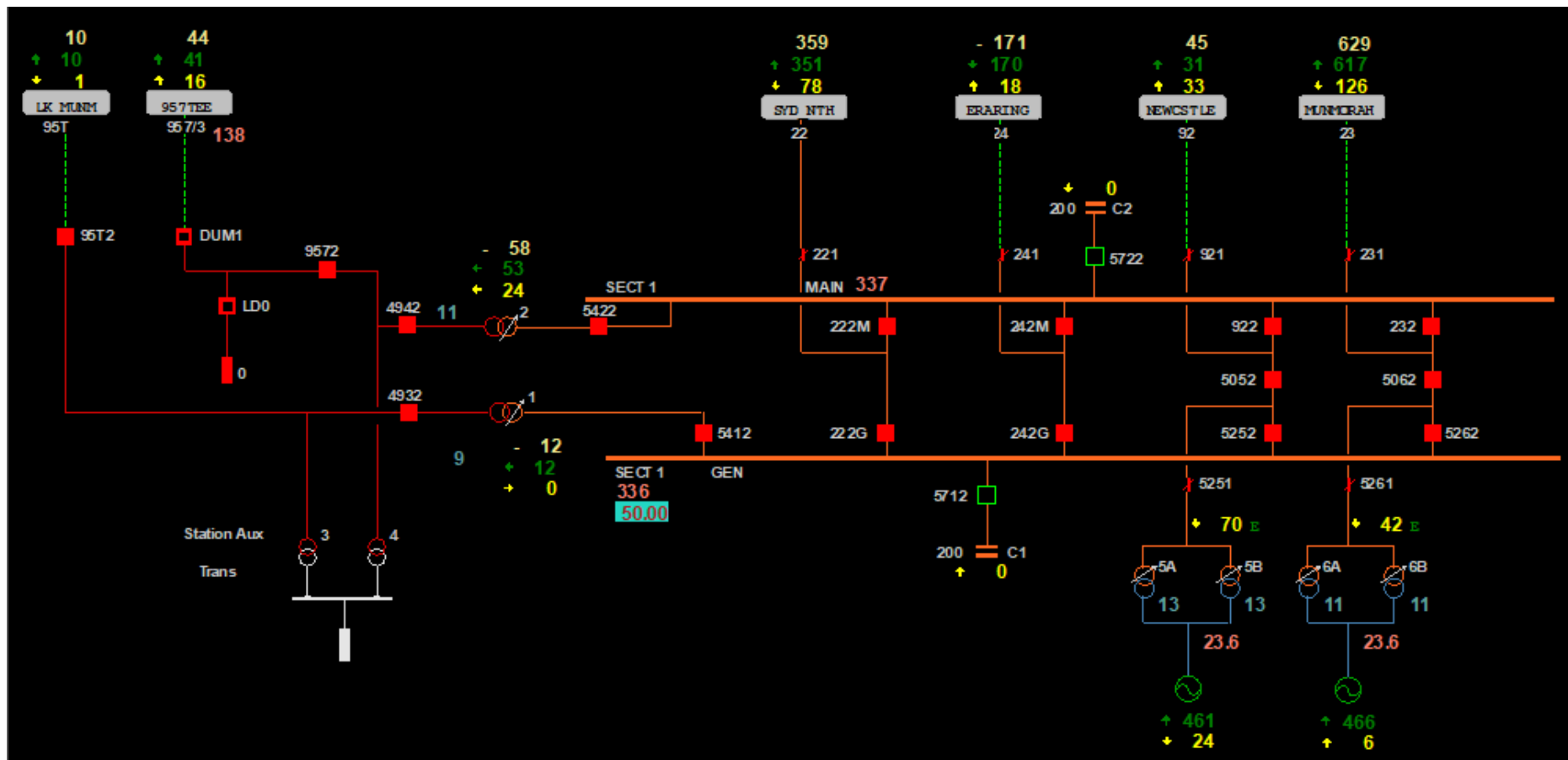
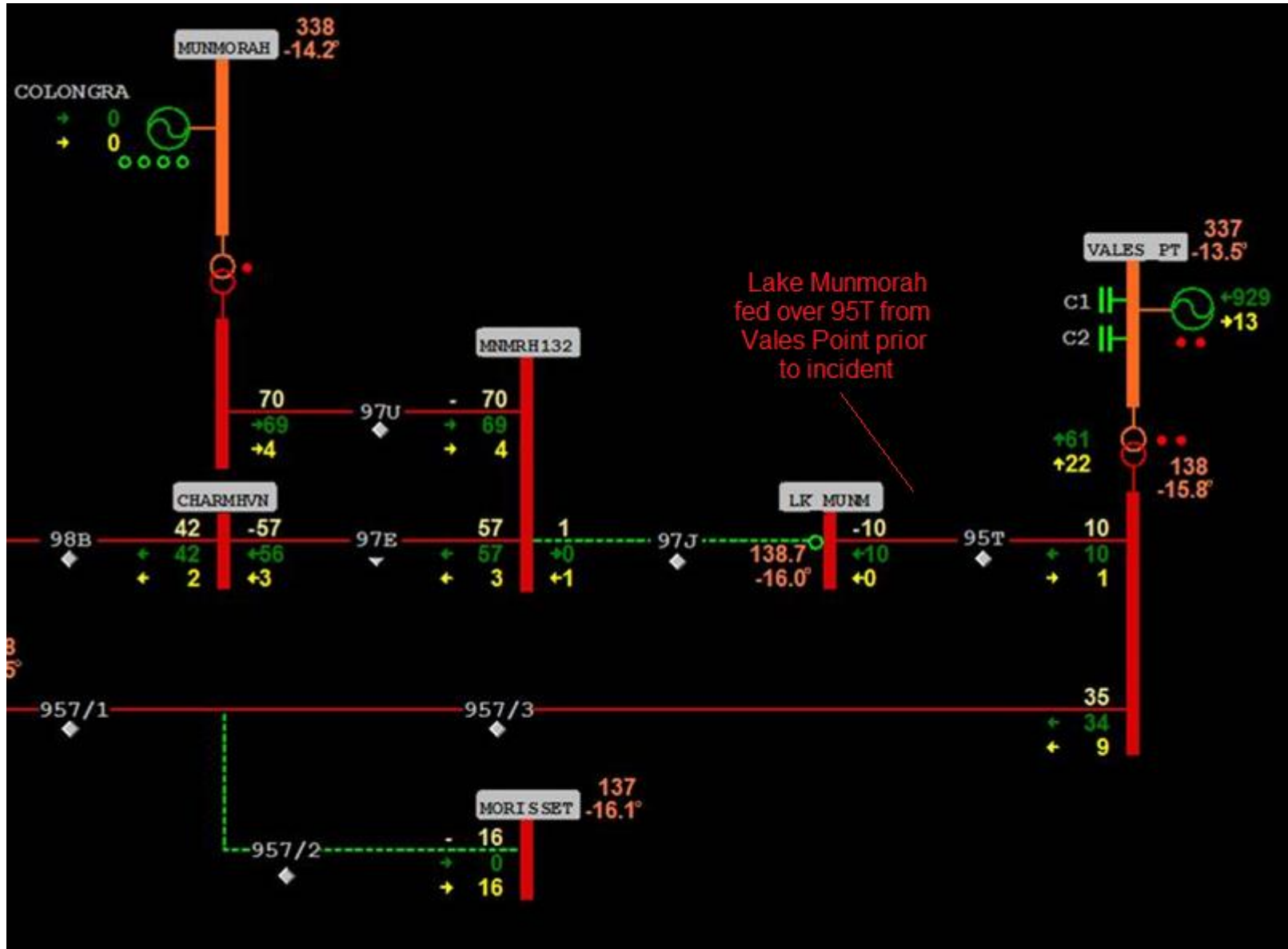


Figure 2 Pre-incident conditions, Lake Munmorah



The diagrams below provide an overview of part of the power system at Vales Point and Lake Munmorah immediately after the incident.

Figure 3 Post-incident conditions, Vales Point

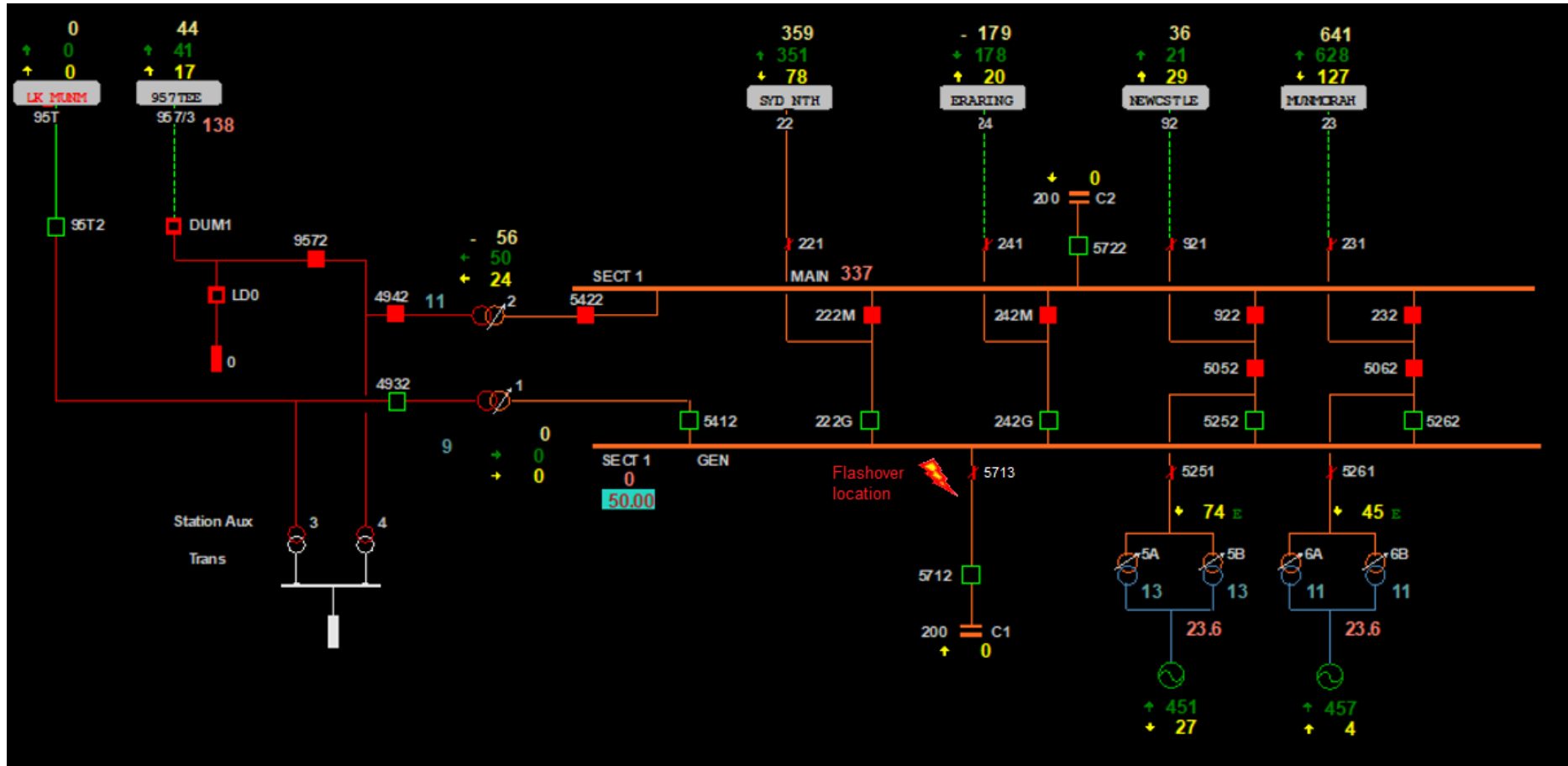
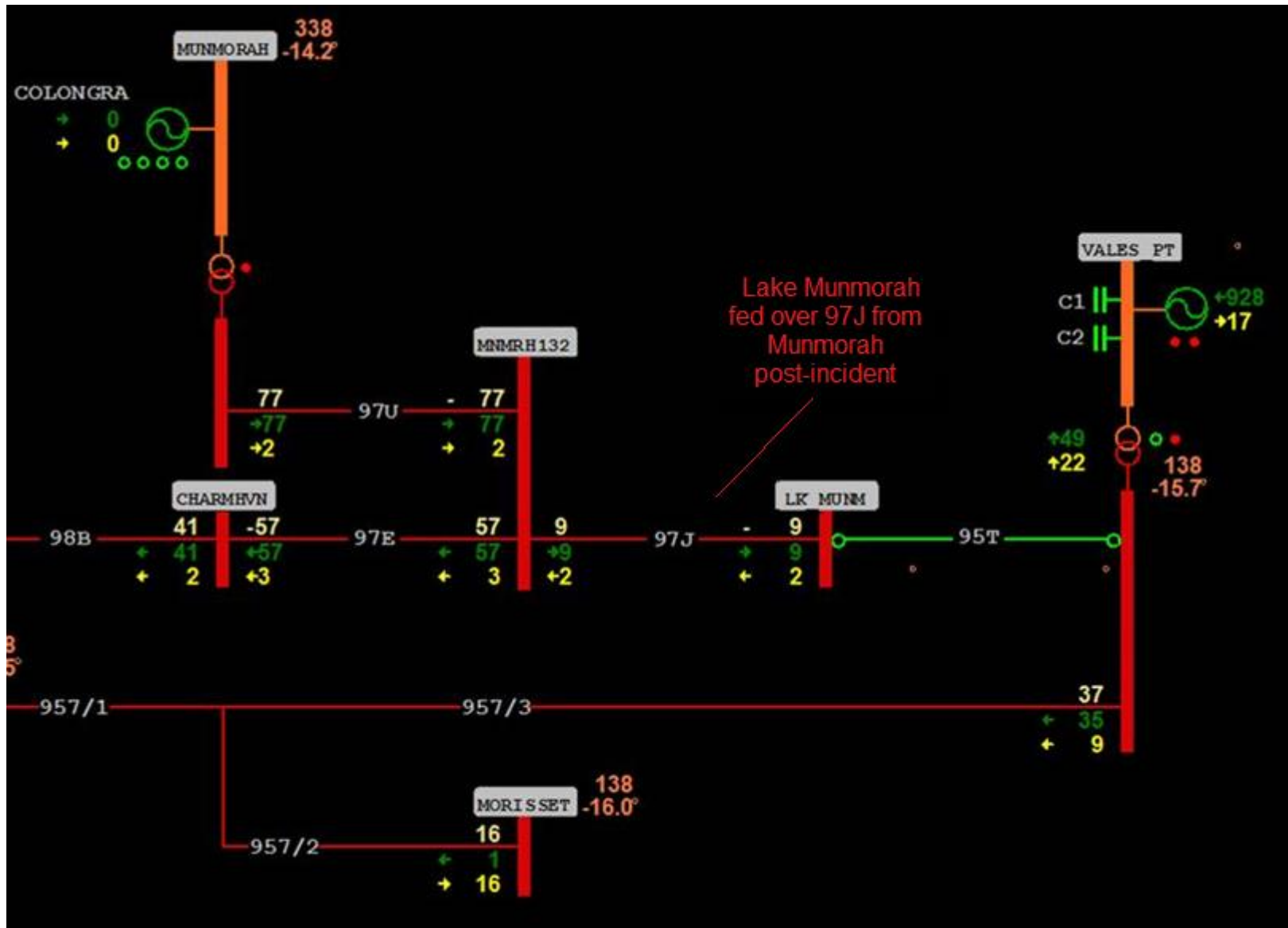


Figure 4 Post-incident conditions, Lake Munmorah



# A3. System load trend

The chart below shows the trip of the Vales Point supply to Lake Munmorah (95T) and the corresponding load (MW) increase at Munmorah substation (over line 97U) due to auto-close of AusGrid circuit breaker at Lake Munmorah (97J). Transfer of load from Munmorah back to Vales Point is shown on the following day.

Note that the Vales Point trend is inverted as positive load flow is displayed towards Vales Point.

**Figure 5 Real power trend for Vales Point 95T and Munmorah 97U feeder throughout incident and recovery**

