AEMO
AUSTRALIAN ENERGY MARKET OPERATOR

Planned Outages in the North Western Victoria & South West New South Wales Transmission Network

February 2019

Industry Communique

Important notice

PURPOSE

This communique is to inform on the planned outages required in the North-West Victorian and South-West New South Wales transmission network and the impacts of those outages on National Electricity Market (NEM) participants in the region.

DISCLAIMER

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1. Overview

Transmission network service providers (TNSPs) in the National Electricity Market (NEM) and network asset owners are required to maintain and upgrade their equipment in order to continue to provide services in line with relevant network performance requirements. This often requires planned outages on the power system to facilitate the safe maintenance and upgrade of network infrastructure. Details of planned outages are posted to AEMO's network outage scheduling tool (NOS) and in the 13 month plans in accordance with AEMO published guidelines[1] and procedures[2].

In accordance with these guidelines and procedures, when a planned outage is entered into NOS, AEMO assesses the impact of the outage on power system security. The factors AEMO considers when assessing planned outages include the power system technical standards, contingency management, forecast demand, generator availability, interconnector availability, weather conditions, gas outages, other line outages, and constraints.

For generators connected to network assets undergoing maintenance, there may be periods when there is a need to curtail output or disconnect to manage system security for the next contingency, or where network equipment is de-energised to allow safe work. Outages can arise due to planned outages or forced (unplanned) outage conditions, including non-credible contingencies.

[1] https://www.aemo.com.au/Electricity/National-Electricity-Market-NEM/Market-notices-and-events/Network-Outages

[2] https://www.aemo.com.au/-/media/Files/Electricity/NEM/Security_and_Reliability/Power_System_Ops/Procedures/SO_OP_3718---Outage-Assessment.pdf

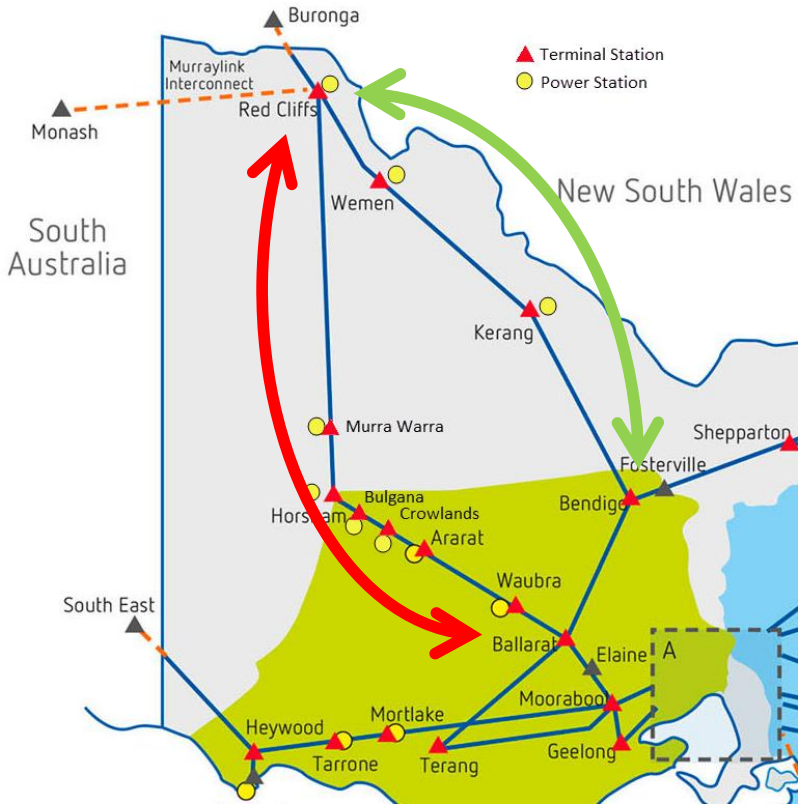
2. Impacts

AEMO studies confirm that any credible outage (n-1) on the North West (NW) loop as shown in Figure 1 results in insufficient minimum fault level and system strength in the area outlined.

Figure 1 shows 2 transmission connections:

1. The Red Cliffs (RCTS) – Wemen (WMTS) – Kerang (KGTS) – Bendigo (BETS) and
2. The Red Cliffs (RCTS) – Horsham (HOTS) – Ararat (ARTS) – Ballarat (BATS)

Figure 1 Affected transmission connections



Studies have shown that a planned outage on any section of either 1 or 2 as illustrated above and the subsequent trip on the other, undamped voltage oscillations can result, with the potential to cause system interruptions or collapse in this region. Under system normal and outage conditions, AEMO must use reasonable endeavours to operate the power system so that it will remain in a satisfactory operating state following a single credible contingency.

Power system stability is the ability of a power system to regain its steady-state conditions after being subjected to a disturbance or following changes in demand or generation. AEMO applies constraints to ensure that flows on transmission lines and generating units are adequate to maintain voltage stability following all credible contingencies.

To account for periods when network elements are taken out of service (either planned or unplanned/forced), AEMO performs power system studies to develop network outage constraints that are designed to keep the system in a satisfactory state following the next credible contingency. This means power system voltages, currents and frequency, line flows and fault levels should remain within designated limits. When a new planned outage request is submitted, AEMO undertakes these outage assessments using PSCAD and PSSE simulation tools.

In addition to power system studies, the impacts of other outages, system conditions and any other determining factors such as weather, are reviewed on a continuous basis. AEMO can only reject or request changes to the outage timing if the outage impacts power system security, and this impact cannot be resolved with changes to limits, constraints or the provision of established network support services.

Power system security can be maintained for the planned outages in NW VIC by applying constraints that will reduce the output of generating systems in the affected area.

Table 1 Summary of outages

North West Vic Loop Outages	Outages	Duration of each outage	Reason
Ballarat to Waubra 220kV line	3	1 day	Conductor replacement for ratings increase from 450MVA to 495MVA
Horsham to Red Cliffs 220kV line	9	1 day	Conductor replacement for ratings increase from 312MVA to 495MVA
Horsham to Crowlands 220kV line	3	1 day	Conductor replacement for ratings increase from 381MVA to 495MVA
Bulgana wind farm connection	2	1day	Wind farm connection
Murra Warra wind farm connection	2	1 day	Wind farm connection
OPGW Comms Project (500km)	76	1/2 -1 day	OPGW stringing for communications replacement
Bendigo to Kerang Insulator Replacement	10	1 day	Replace insulators
Kerang to Wemen Tower Repair	1	1 day	Remove temporary tower
Kiamal solar farm connection	3	1 day	Solar farm connection
Kerang SVC	1	2 Days	Maintenance
Horsham SVC	1	2 Days	Maintenance

The impact of the planned outages that AEMO has reviewed in detail using PSCAD studies is summarised in table 2. AEMO has completed studies for all VIC outages presented in NOS as at 14 February 2019.

Please note that studies will continue and conditions may change, so these results could vary.

Table 2 Impacts for Planned outages in NOS as at 14 February 2019

Planned Outages in NOS	Impact
Ballarat to Waubra 220 kV lines	Ararat WF & Crowlands WF <= 5 MW Bannerton SF = 0 Broken Hill SF = 0 Gannawarra SF = 0 Horsham SVC – OFF Karadoc SF = 0 Kerang SVC - OFF Silverton WF = 0 Wemen SF = 0 Waubra WF = 0 Murraylink VIC to SA = 0 Murraylink SA to VIC = 0
Ballarat to Waubra & Red Cliffs to Wemen 220 kV lines	Ararat WF & Crowlands WF <= 5 MW Bannerton SF <= 32 MW Broken Hill SF = 0 Horsham SVC – OFF Karadoc SF = 0 Silverton WF = 0 Waubra WF = 0 Wemen SF = 0
Crowlands to Horsham 220 kV lines	Bannerton SF = 0 Broken Hill SF = 0 Gannawarra SF = 0 Horsham SVC – OFF Karadoc SF = 0 Kiata WF = 0 Wemen SF = 0 Murraylink VIC to SA <= 200 MW Murraylink SA to VIC <= 150 MW
Horsham to Red Cliffs 220 kV lines	Bannerton SF <= 32 MW Broken Hill SF = 0 Gannawarra SF = 0 Karadoc SF = 0 Wemen SF = 0 Murraylink VIC to SA <= 200 MW Murraylink SA to VIC <= 150 MW
Kerang to Wemen 220 kV lines	Bannerton SF = 0 MW Broken Hill SF = 0 Horsham SVC – OFF Karadoc SF = 0 Wemen SF = 0 Murraylink VIC to SA <= 200 MW Murraylink SA to VIC <= 150 MW
Kerang to Wemen to Red Cliffs 220 kV lines	Bannerton SF = 0 MW Broken Hill SF = 0 Horsham SVC – OFF Karadoc SF = 0 Wemen SF = 0 Murraylink VIC to SA <= 200 MW Murraylink SA to VIC <= 150 MW

Planned Outages in NOS	Impact
Red Cliffs to Wemen 220 kV lines	Broken Hill SF = 0 Horsham SVC – OFF Karadoc SF = 0 Wemen SF = 0 Murraylink VIC to SA <= 200 MW Murraylink SA to VIC <= 150 MW

Note: Outages are always subject to change.

3. Questions and Answers

Why hasn't AEMO required constraints during previous outages in this region?

Operationally, the system in NW Victoria is changing rapidly as a result of new generator connections. In 2018 alone, 480 MW was connected to the grid. This has substantially changed the short circuit ratio and fault current levels which impact voltage stability behaviour in this region of the network. The system is vastly different to when a major outage last occurred in the area.

Are these outages required?

Yes. TransGrid and AusNet Services require outages on the power system to maintain a safe and secure network or perform required upgrades.

Replacement of communication infrastructure and upgrades to transmission line conductor capacity are necessary to incorporate the significantly increased volume of generation in the NW VIC network. Replacement of communication lines in North Western Victoria is required as the communication lines are presently at capacity.

Upgrades to line capacity include increases from 312 MVA up to 495MVA in line capacity in parts of the NW Vic network. This will enable more energy transfer on these lines and is a benefit to the generators in the region.

Works to deliver projects under the Network Capability Incentive Projects Action Plan (NCIPAP) scheme and the connection of new generators must be completed.

Does this mean my generator(s) output will be affected?

Generators in NW Vic and SW NSW will be impacted by constraints at various levels to maintain system security. Several generating systems will be constrained down to zero during some of the planned outages.

Differences in generator limits are due to electrical location, tuning/parameters of plant controllers and tuning of the models used in the studies.

Is there any way AEMO can prevent these system constraints?

AEMO is assessing all alternatives available to reduce the impact to generators during these planned outages. This includes the potential for run back schemes and the potential operation of synchronous machines to provide system strength. However, at this stage both options are proving insufficient.

How has AEMO verified its analysis?

AEMO has developed a detailed PSCAD model of VIC and Southern NSW based on validation with actual operational data. The model and studies are currently being reviewed by external engineering and modelling experts.

How does AEMO plan to address this situation in the future?

Short-term

From a planning perspective, AEMO's Victorian Annual Planning Review (VAPR) reports are intended to capture emerging stability issues focusing on credible contingency analysis (i.e. N-1 conditions). The identified voltage stability issue impacting the NW VIC network during planned outages requires a credible contingency to occur with a prior outage already in place (i.e. N-2 conditions). This is typically beyond the scope of standard planning assessments.

AEMO is scoping necessary control scheme changes and assessing their economic justification under the current Transmission Regulatory Framework.

AEMO will use the 2019 VAPR (due for publication in June 2019) to explore this emerging voltage stability limitation in more detail though its standard planning processes. If required (and economically justified), longer-term network solutions might be initiated (through NCIPAP projects, minor augmentations, or RIT-Ts where appropriate).

Longer-term

AEMO is currently conducting a Regulatory Investment Test for Transmission (RIT-T) to assess solutions to address the forecast network congestion in Western Victoria. The purpose of the RIT-T is to identify credible options to relieve congestion and to increase the capability of the power system to facilitate the connection of new generation in this area where it will result in a positive net market benefit. AEMO has also commenced a RIT-T for Victorian Reactive Power Support. Delivery of existing RIT-T projects (such as Western Victorian and Riverlink), may provide partial remediation.

This RIT-T marks the first step in Victoria for what is a much larger, strategic transmission infrastructure development plan underway to assess and coordinate future transmission and generation across the National Electricity Market as outlined in AEMO's Integrated System Plan[3].

Where can I find out information on the network outages?

The network outage schedule (NOS) includes all the latest outage information. This schedule is updated every 30 minutes and is available on the AEMO website.[4]

Victorian outages over the longer timeframe are published in the 13-month outage plan which is updated monthly.[5]

How will I know if my generator would be constrained for an outage?

When AEMO completes studies on outages this is included in AEMO's limits advice documents. These documents are available on the AEMO website[6].

This limits advice is turned into constraint equations which are added to the constraint sets for the outage(s) that have been studied. This data is available to all market participants on MMS Data Interchange or MMS Web[7].

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[3] Available at http://aemo.com.au/-/media/Files/Electricity/NEM/Planning_and_Forecasting/ISP/2018/Integrated-System-Plan-2018_final.pdf

[4] Available at https://www.aemo.com.au/Electricity/National-Electricity-Market-NEM/Data/Network-Data/Network-Outage-Schedule

[5] https://www.aemo.com.au/Electricity/National-Electricity-Market-NEM/Data/Network-Data/Planned-Electricity-Network-Outages

[6] Available at https://www.aemo.com.au/Electricity/National-Electricity-Market-NEM/Security-and-reliability/Congestion-information/Limits-advice

[7] Available at http://mms.prod.nemnet.net.au/mms/login.aspx

Is there an impact to the community or consumer?

No load is planned to be interrupted to perform these outages.

However, there is always a risk that an incident on the electricity network can impact supply to consumers. The likelihood of an incident may be slightly increased due to the presence and volume of outages on the power system in the NW Vic region.

AEMO always aims to maintain the security of the power system and avoid any impact to consumer supply.

Do generators have to adjust their bids for planned outages?

Participants should bid in accordance with the National Electricity Rules. AEMO does not advise participants on bids other than where required in connection with a formal direction.