OUTAGE ASSESSMENT

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Approved for distribution and use by:
APPROVED BY: Damien Sanford
TITLE: Chief Operations Officer

DATE: 24 December 2019
## VERSION RELEASE HISTORY

<table>
<thead>
<tr>
<th>Version</th>
<th>Effective Date</th>
<th>Summary of Changes</th>
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</thead>
<tbody>
<tr>
<td>13.0</td>
<td>24 December 2019</td>
<td>Moved the information about basic principles used in outage assessment from the 'High Impact Outages' section to the 'General Principles' section</td>
</tr>
<tr>
<td>12.0</td>
<td>18 May 2019</td>
<td>Updated following NOS upgrade project</td>
</tr>
<tr>
<td>11.0</td>
<td>23 May 2018</td>
<td>Updated constraint invocation to semi-scheduled generators</td>
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<td></td>
<td></td>
<td>Updates on Recall Time for High Impact outage</td>
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<tr>
<td></td>
<td></td>
<td>Clarify outage submission for assessment including transmission lines switched off for voltage control.</td>
</tr>
<tr>
<td>10.0</td>
<td>24 February 2017</td>
<td>Clarified conditions under which the outage status can be changed to Unlikely to Proceed</td>
</tr>
<tr>
<td>9.0</td>
<td>22 February 2017</td>
<td>Updated the basis for identification of High Impact Outages (HIOs) and provided the link to the published list of upcoming HIOs on AEMO website.</td>
</tr>
<tr>
<td>8.0</td>
<td>04 September 2015</td>
<td>Updated information on Constraint application section and Out of service work and in-service work.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Added new sections on Recall time for planned outages.</td>
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<tr>
<td></td>
<td></td>
<td>Reviewed the entire procedure.</td>
</tr>
<tr>
<td>7.0</td>
<td>23 September 2014</td>
<td>Updated Short Term Outage Assessment Section to make DNSP aware monitoring flexible.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Updated MT Outage Assessment responsibility to Congestion Modelling.</td>
</tr>
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<td></td>
<td></td>
<td>Minor edits.</td>
</tr>
<tr>
<td>6.0</td>
<td>26 May 2014</td>
<td>Changes made to reflect incorporation of ASEFS into market systems processes.</td>
</tr>
<tr>
<td>5.0</td>
<td>19 February 2014</td>
<td>Format changes, and minor edits only.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Glossary updated.</td>
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<tr>
<td></td>
<td></td>
<td>AEMO Operational Zone meaning given</td>
</tr>
<tr>
<td>4.0</td>
<td>14 January 2014</td>
<td>Updated to reflect the commencement of Instrument of Delegation with TransGrid and Powerlink.</td>
</tr>
<tr>
<td>3.0</td>
<td>13 November 2013</td>
<td>Information related to assessment of concurrent outages has been added in the constraints application section.</td>
</tr>
<tr>
<td>2.0</td>
<td>17 September 2013</td>
<td>Inclusion of 13 Month Outage Plan in planned outage section.</td>
</tr>
<tr>
<td>1.0</td>
<td>15 August 2013</td>
<td>New procedure created to reflect the cessation of the TNSP Operating Agreements and commencement of the Instruments of Delegation from AEMO to SPI PowerNet and Transend dated 12 August 2013</td>
</tr>
</tbody>
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1. **INTRODUCTION**

(a) This Outage Assessment procedure is made in accordance with 3.7 of the National Electricity Rules (NER).

(b) If there is any inconsistency between this procedure and the NER, the NER will prevail to the extent of that inconsistency.

1.1. **Purpose and scope**

These are the Outage Assessment made under clause 4.10.1 (Procedures).

These Procedures have effect only for the purposes set out in the National Electricity Rules. The NER and the National Electricity Law prevail over these Procedures to the extent of any inconsistency.

The purpose of this procedure is to detail the assessment process for outages of transmission plant in the NEM.

1.2. **Application**

This procedure applies to AEMO and all Registered Participants in all NEM regions.

1.3. **Definitions and interpretation**

1.3.1. **Glossary**

Terms defined in the National Electricity Law and the NER have the same meanings in these Procedures unless otherwise specified in this clause.

Terms defined in the NER are intended to be identified in these Procedures by italicising them, but failure to italicise a defined term does not affect its meaning.

The words, phrases and abbreviations in the table below have the meanings set out opposite them when used in these Procedures.

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>AEMO Operational Zone</td>
<td>As defined in each of the Regional Power System Operating Procedures, except for Queensland, in which case it is taken to mean the Queensland Transmission Network, as defined in the Regional Power System Operating Procedure - Queensland</td>
</tr>
<tr>
<td>AWEFS</td>
<td>Australian Wind Energy Forecasting System</td>
</tr>
<tr>
<td>ASEFS</td>
<td>Australian Solar Energy Forecasting System</td>
</tr>
<tr>
<td>CA</td>
<td>Contingency Analysis</td>
</tr>
<tr>
<td>CIR</td>
<td>Congestion Information Resource</td>
</tr>
<tr>
<td>DS</td>
<td>Dispatch</td>
</tr>
<tr>
<td>DSA</td>
<td>Dynamic Security Assessment</td>
</tr>
<tr>
<td>ECS</td>
<td>Emergency Control Scheme</td>
</tr>
<tr>
<td>FCAS</td>
<td>Frequency Control Ancillary Service</td>
</tr>
<tr>
<td>I/S</td>
<td>In service</td>
</tr>
<tr>
<td>INFO</td>
<td>Information Only</td>
</tr>
<tr>
<td>MT</td>
<td>Medium term</td>
</tr>
</tbody>
</table>

Table 1  Glossary
## Term Definitions

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>MTLTP</td>
<td>Medium Term Likely to Proceed</td>
</tr>
<tr>
<td>NOS</td>
<td>Network Outage Scheduler</td>
</tr>
<tr>
<td>NSP</td>
<td>Network Service Provider</td>
</tr>
<tr>
<td>OOS</td>
<td>Out of service</td>
</tr>
<tr>
<td>PASA</td>
<td>Projected Assessment of System Adequacy</td>
</tr>
<tr>
<td>PD</td>
<td>Pre-dispatch</td>
</tr>
<tr>
<td>PDLTP</td>
<td>Pre-dispatch Likely to Proceed</td>
</tr>
<tr>
<td>POE</td>
<td>Probability of Exceedance</td>
</tr>
<tr>
<td>PSS/E</td>
<td>Power System Simulator for Engineering</td>
</tr>
<tr>
<td>PTP</td>
<td>Permission to Proceed</td>
</tr>
<tr>
<td>PTR</td>
<td>Permission to Restore</td>
</tr>
<tr>
<td>ST</td>
<td>Short term</td>
</tr>
<tr>
<td>STLTP</td>
<td>Short Term Likely to Proceed</td>
</tr>
<tr>
<td>VSAT</td>
<td>Voltage Security Assessment Tool</td>
</tr>
<tr>
<td>UTP</td>
<td>Unlikely to Proceed</td>
</tr>
</tbody>
</table>

### 1.3.2. Interpretation

These Procedures are subject to the principles of interpretation set out in Schedule 2 of the National Electricity Law.

### 1.4. Related Policies and Procedures

#### Table 2

<table>
<thead>
<tr>
<th>Policies and Procedure</th>
<th>Title</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>NER Chapter 3 and 4</td>
<td>National Electricity Rules</td>
<td></td>
</tr>
<tr>
<td>SO_OP_6300 Series</td>
<td>AEMO power system operating procedures</td>
<td></td>
</tr>
</tbody>
</table>

### 2. General Principles

AEMO will only allow an outage to proceed on the basis that the outage will not result in a power system security or reliable operating state violation. Consideration must also be given to what actions would be required to return the power system to a secure operating state within thirty minutes following a credible contingency event or a significant change in power system conditions during the outage period. This principle applies to all outages including concurrent and/or high impact outages.

The AEMO outage assessment process relies upon information provided by registered participants of changes in transmission system and generation conditions. The primary method of communication is via the AEMO Network Outage Scheduler (NOS) for transmission system outages and market systems for bids or offers for scheduled plant.
AEMO provides an outage assessment function in the medium term, short term and pre-dispatch periods before transmission network outages are given permission to proceed (PTP) at the time of dispatch. An overview of the process is presented in Figure 1.

### Figure 1  Outage Assessment Process

![Outage Assessment Process Diagram]

### 3. RESPONSIBILITIES

AEMO is responsible for power system security and the application of network constraints to the market system. A detailed outage assessment can only be carried out successfully if a sufficient level of information is provided to AEMO in a timely manner. NSPs require appropriate responses from AEMO to aid in their transmission outage planning process and registered participants in general require information for their own purposes. The following NER references highlight these areas. For information on PASA timeframes refer NER clause 3.7, in particular:

- 3.7.1: Administration of PASA.
- 3.7.2: Medium Term PASA.
- 3.7.3: Short Term PASA.

For information on dispatch timeframe refer NER clause 3.8, in particular:

- 3.8.1: Central Dispatch.
- 3.8.10: Network Constraints.
- NER Chapter 4 outlines obligations regarding power system security.

To ensure the network outage assessment process is managed in an ordered manner a distribution of responsibility applies for the medium term, short term, pre-dispatch and dispatch periods. Specific AEMO departments are responsible for the assessment of transmission system outages as depicted in Table 3.
Table 3  Responsibility of Transmission Outages

<table>
<thead>
<tr>
<th>Time Period</th>
<th>AEMO Staff Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dispatch</td>
<td>NEM RTO</td>
</tr>
<tr>
<td>Pre-dispatch</td>
<td>NEM RTO</td>
</tr>
<tr>
<td>Short Term</td>
<td>Operations Planning</td>
</tr>
<tr>
<td>Medium Term</td>
<td>Congestion Modelling</td>
</tr>
</tbody>
</table>

4. TIMING OF OUTAGE SUBMISSION

Outages should be submitted to AEMO at the earliest possible time so that forecast network capability is accurately reflected. To assist in processing and audit of submitted outages there are three classifications associated with time of submission. Planned, short notice and unplanned classifications are defined in the AEMO glossary. The reason for the existence of each is summarised in this section.

4.1. Planned Outages

For planned outages, information must be provided to AEMO via the NOS. Based on this and other market information, outcomes of the outage assessment process are:

- Feedback to the NSP on the likelihood of an outage proceeding.
- Development and invocation of any required constraint sets or equations.
- A consistent forecast of power system reliability and network capability to participants throughout the MT PASA, ST PASA and pre-dispatch timeframes.
- Publication of 13 Month Outage Plan as a part of Congestion Information Resource (CIR).

4.2. Short Notice Outages

For short notice outages, the advice is the same as for planned outages with one additional requirement. As well as the NOS information, phone communication by the TNSP is required to ensure a timely response to the short notice condition by AEMO.

4.3. Unplanned Outages

A TNSP must immediately advise AEMO, by telephone of any unplanned outages in the AEMO Operational Zone and any other unplanned outages where a NOS entry would normally be required as detailed in the regional power system operating procedures. For any unplanned outage that requires AEMO to invoke a constraint a NOS entry must be provided as soon as possible after the event, regardless of the outage duration. For unplanned outages not requiring a constraint, a NOS entry is only required if the equipment is not returned to service within 15 minutes.
5. **AEMO OUTAGE ASSESSMENT TIMETABLE**

In general, at least one outage assessment will take place for each planned outage submitted to the NOS during each defined timeframe of medium term (MT), short term (ST), pre-dispatch (PD) and dispatch (DS). There is some overlap of ST and MT assessment times. The aim of this is to assist in meeting ST requirements prior to the publication of ST PASA. As part of the Congestion Information Resource, AEMO also publishes information on planned network outages for the subsequent 13 months. This 13 Month Outage Plan fits within the MT period. The timetable applicable to the outage assessment process is presented in Figure 2.

![Outage Assessment Timeline](image)

The ideal processing situation is for AEMO to perform a single outage assessment during each timeframe, considering all outages entered in the NOS at that time. In practice this is sometimes not feasible because the load forecast or the outage information in NOS may have changed. Hence, additional outage assessments may be carried out during each timeframe.

6. **OUTAGE SUBMISSION TO AEMO VIA NOS**

The degree of information required by AEMO to process outages is limited to what is needed to correctly model the situation and assess power system security and reliability of supply implications.

The AEMO Network Outage Scheduler (NOS) has been developed to transfer this information between each TNSP and AEMO. NOS operation is referenced in this document but is not illustrated as it is a specialist software package for specific users. Accordingly independent assistance is available in this area.

6.1. **NOS Outage Submission for a Network Element**

The prime considerations when assessing an outage is the impact on power system security and reliability of supply caused by the unavailability of a network element. This is not related in any way...
to the number of work groups performing specialised tasks. AEMO requires NOS submission of all network elements affected, with grouping of network elements in NOS if elements are associated on an operational basis. Some examples to clarify this would be as follows:

- Multiple work groups during an outage of one network element.
  - One NOS entry only is required to identify the network element.
- Associated network element outages.
  - Associated network element outages should be included in the same NOS submission. Some examples of this would be:
    - A bus outage that offloads a transmission line. The bus and line are to be submitted as one NOS record. In the case of a bus outage, of a bus connected to a breaker and a half scheme, the breakers connected to the OOS bus do not have to be submitted if no other equipment is offloaded. The exception is when a constraint is required with an associated breaker that will be out of service.
    - Breaker and a half or double selection bay outages. The bay components as well as the disconnected line, transformer, etc. are to be submitted as one NOS record. If the bay equipment is not included it will be assumed that isolation has been made on an equipment isolator and the bay restored to normal service during the outage.
    - A transformer outage, where the transformer is directly connected to a line. The de-energised line and the transformer must also be submitted.
    - A circuit breaker outage, which removes other equipment from service. The circuit breaker as well as the other OOS equipment must be submitted.
  - Short duration off-loading of equipment during switching may be required to achieve isolation for an outage. An example of this would be where equipment is connected to a bus via an isolator only. The bus is required to be switched to achieve isolation. For this and similar scenarios:
    - Off-loading of less than 15 minutes duration during switching must be noted in the booking notes of the NOS record.
    - Off-loading of greater than 15 minutes duration during switching must be advised by independent NOS submission.

6.2. Classifications of Outage Submission

The definitions provided below are associated with the processing of outages via NOS. There are two high level classifications of NOS entry (assessment and information). These indicate if assessment is required by AEMO or not. Within each of these classifications, the outage is sub-categorised as out-of-service (OOS) or in-service (I/S) as illustrated in Figure 3.
The details of what outages are required to be submitted to NOS, and the associated classifications, are detailed in the regional power system operating procedures. The general principles used to determine the classification of outages are detailed below.

6.2.1. Submit for Assessment

The scope of assessment is to ensure the power system in AEMO Operational Zone (as defined in the regional power system operating procedures) remains in a secure and reliable operating state. All outages in this category require PTP / PTR from AEMO. Outages submitted for assessment include:

- All outages in AEMO Operational Zone.
- Outages not in AEMO Operational Zone where:
  - The outage may cause a security violation in AEMO Operational Zone.
  - The outage involves constraint invoke or revoke. In this case the scope of assessment is limited to constraint management.
  - The outage has FCAS implication by placing large loads at risk. In this case the scope of assessment is limited to constraint management.
  - The outage affects bus connections within AEMO Operational Zone.
  - The outage involves reactive plant that is regarded as supporting the transmission system.
- Any transmission lines taken out of service for voltage control.

6.2.2. Submit for Information

Outages in this category do not require PTP/PTR from AEMO. Generally, outages submitted for information include:

- Transmission system equipment not in AEMO Operational Zone but represented in the AEMO network model.

The INFO category relates to equipment outage information provided to AEMO, primarily for the purpose of network modelling accuracy. The task of maintaining system security in TNSP’s operational zone lies with the respective TNSP acting as an agent of AEMO. It does not require assessment by AEMO. However the NSP is required to acknowledge all security violations have been addressed.

Additional information and contingency plans associated with this category may be requested at any time at the discretion of AEMO. Outages in this classification are detailed in the relevant regional power system operating procedures.
AEMO may at any time request that an outage normally in the ‘information’ category be submitted to NOS for complete AEMO outage assessment. If this occurs, the circumstances must be logged and reported to the Manager NEM RTO for review.

6.2.3. Outages not requiring a NOS entry
Generally AEMO does not require notification of the following types of outages in the TNSP’s Operational Zone unless specifically listed in the relevant regional power system operating procedures:

- In-service protection or communication outages where a protection, metering or control scheme is made unavailable.
- Radial lines and associated protection and communication schemes where the outage does not cause an outage to the interconnected system.
- 132/110 kV bulk supply transformers where there is no interruption to the interconnected system.

AEMO may at any time request any outage in the above categories be entered in NOS if AEMO considers the information is required for AEMO to carry out its power system security functions.

6.2.4. Out-of-service work
- Where network switching results in the off-loading or removal of a network element, or
- Where an emergency control scheme (ECS) or other automated function is made unavailable resulting in reduced capability of the power system. For this purpose, an ECS is not a component of the protection system associated with a single item of equipment. It is an automated scheme that results in modification to power flow given specified trigger conditions and has an identifiable equipment name in NOS. This includes:
  - Schemes designed to reduce power system loading.
  - Schemes designed to modify power system configuration.
  - Schemes designed to modify generation.

6.2.5. In-service work
Where a power system service (secondary equipment) is disabled.

This may include:

- Where a protection, metering or control scheme is made unavailable.
- Where it is planned to momentarily interrupt and immediately restore load during testing of an automated scheme such as auto-reclose.
- Where communication equipment being made unavailable such that a function associated with the transmission network is disabled.
- Where telemetered information or other functionality normally provided to AEMO is made unavailable due to any nature of work.
- Where transformer auxiliary systems (fans etc.) are disabled and transformer capacity is impacted

This does not include live line work where the only consequence is that the auto-reclose is made unavailable.

6.3. Detail Accompanying Outage Submission
Out-of-service
The critical aspect is the impact on the network. In the simplest case, plant is advised as being unavailable and is then removed from the AEMO network model during analysis. Once it is removed from the AEMO network model, the detail of physical work being undertaken does not, in most cases, provide any more useful information. For routine outages, high level work information is available in the mandatory NOS fields, accordingly work detail is not required in the NSP Booking Notes unless specifically requested by AEMO. Network configuration for out-of-service and Info work is critical for AEMO modelling purposes and must be provided.

In-service

The nature of the work is required but specifically in terms of impact or services affected and risk which require assessment by AEMO. The NOS entry should clearly state the equipment, service or data that is made unavailable and the impact on power system security and operation of the NEM.

Table 4 lists the information required for the different categories of outages submitted to NOS. This is a general guide and more information may be requested by AEMO at any time.

<table>
<thead>
<tr>
<th>Information Required in NOS</th>
<th>Submit as OOS Work</th>
<th>Submit as I/S Work</th>
<th>Submit as Info</th>
</tr>
</thead>
<tbody>
<tr>
<td>Provide specific equipment ID</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>List HV equipment taken ‘Off-Load’</td>
<td>Yes</td>
<td>N/A</td>
<td>Yes</td>
</tr>
<tr>
<td>Detail any Network Configuration Changes</td>
<td>Yes</td>
<td>N/A</td>
<td>Yes</td>
</tr>
<tr>
<td>List secondary equipment being disabled</td>
<td>N/A</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>List any Service or Information to AEMO being disabled</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>List abnormal risk issues</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>List possible security violations</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Acknowledge that violations are addressed</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Contingency Plan is attached</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Provide exact detail of work being undertaken</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>

7. HIGH IMPACT OUTAGES

AEMO has the responsibility to make available to registered participants information about the potential for, or the occurrence of, a situation which could significantly impact, or is significantly impacting on the power system.

To meet this requirement AEMO may identify certain network outages as “High Impact Outages”.

These are outages during which, in AEMO’s reasonable assessment, the power system can be operated in a secure operating state, however following a credible contingency event the actions taken by AEMO to return the power system to a secure operating state within thirty minutes could have a significant impact on the power system and the market.

The basis for identifying High Impact Outages in the NEM transmission network is governed by the outcomes of network studies or past experience where it is identified that:

- During the outage there is a potential for Energy and FCAS prices to approach the Market Price Cap or Market Price Floor; and/or
- Following a credible contingency event there is a potential for one or more of the followings:
  - a reduction in supply that may be expected to result in involuntary load shedding
○ separation of parts of the network into large islands of scheduled generation, networks and loads; e.g. North / South Tasmania, any region(s) separated from the NEM.

○ requirement for market intervention through issuing of directions; or

○ disconnection of generation in the region, which exceeds the size of the single largest credible contingency under normal operating conditions.

In the assessment of High Impact Outages, AEMO will determine the maximum supportable demand for the region or area affected where applicable. This will be the demand above which load shedding would be required to return the power system to a secure operating state within thirty minutes should the credible contingency event occur.

If the forecast demand is within 200 MW of the maximum supportable demand, AEMO will issue a market notice identifying the outage and provide information about the potential impact on the power system on the occurrence of a credible contingency event during that outage.

The updated list of upcoming High Impact Outages in the NEM can be found on AEMO’s website which is updated weekly.

If the recall time is greater than 30 minutes for the defined high impact outage, relevant TNSP should also provide the summary of work in the NOS booking notes.

AEMO will indicate if an outage is considered a High Impact Outage in NOS.

8. OUTAGE ASSESSMENT

During each time period of MT, ST and PD, AEMO will assess outages and respond to the relevant TNSP. Advice provided by AEMO at all times prior to dispatch will indicate probable violations as they become apparent, given the conditions of study. The parameters associated with assessment in each timeframe are discussed in this section.

8.1. Medium Term Outage Assessment

MT outage assessment includes the use of a number of uncertain study variables. Three significant variables are:

- Generation configuration.
- Region demand.
- System configuration.

These three variables have the potential to change the outcome of a security assessment. Hence for MT assessment, the process is aimed at identifying possible security or reserve issues given typical study parameters.

8.1.1. MT Study Method

Any of the following study methods may be used for MT outage assessment:

- MT PASA reserve assessment in the following cases:
  - Where an inter-regional transfer limit reduction is the only impact of the outage and it is addressed by the applied constraint in MT PASA.
  - Where an intra-regional transmission limitation is the only impact of the outage and it is addressed by the applied constraint in MT PASA.

- Previous relevant study results including clash lists, outage guides, or similar. The source of such documentation may be AEMO or TNSP for MT application.

- The AEMO EMS applications, Powerflow, CA, VSAT, Short circuit analysis and DSA.
• PSS/E in cases where there is a need to study system augmentation.

8.1.2. MT Study Parameters

- *Network Configuration* (including bus tie status) as advised via the NOS.
- *Generation* as per typical system conditions with regard to availability in MT PASA (This includes semi-scheduled wind and solar farm generation output based on AWEFS and ASEFS forecast).
- Worst case *generation* pattern, including maximising *generation* in a particular power station or within a specific area if necessary.
- Any agreed specific *generation* condition advised by the TNSP via NOS.
- Any *network limits* advised by the TNSP via NOS.
- Any agreed *network support agreement* advised by the TNSP via NOS.
- Any arrangements included in a contingency plan advised by the TNSP via NOS.
- Demand will be 50% POE forecast.

8.1.3. MT Assessment Priority

*AEMO* will endeavour to provide a response to Medium Term *outage* notifications at the earliest possible time. Response time may vary depending on resources available at the time. Generally *outages* will be assessed on a chronological basis in the following priority order:

1) *Outages* requiring *constraints* within the 13 Month Outage Plan.
2) *Outages* not requiring *constraints* within the 13 Month Outage Plan.
3) Other *outages* in MT timeframe.

This priority order will be modified to accommodate any *outage* assessment if requested via phone by a TNSP.

8.1.4. MT Study Results

General results should indicate any system security violations or *reserve* issues detected. More specific cases may include the possible restriction of *generation* at particular sites due to an *outage*. Any *constraint* development required should be identified at this stage and implemented as soon as complete. Any issues to be addressed should be resolved as soon as possible, if required any issues will be raised in NOS and *outage* assessment will not proceed further until the issue is resolved.

If all issues associated with an assessment have been addressed the *outage* status will be changed to MTLTP in NOS.

8.2. Short Term Outage Assessment

*ST outage* assessment includes the use of more reliable variables than the MT assessment however two of the variables, *generation* and demand, are still not known with a great amount of certainty. These and possibly other variables have the potential to change the outcome of a security assessment study. Hence for ST assessment, the process is aimed at identifying possible security or *reserve* issues given typical real time study parameters.

Within the ST assessment timeframe is the requirement to comply with NER clause 4.10.3 (b). This states that AEMO will endeavour to give at least 3 days’ notice to relevant DNSPs in cases where network switching planned by a TNSP could affect security of supply to a distribution network. In accordance with regional power system operating procedures, this notice will be provided to the DNSP by the TNSP on AEMO’s behalf.
8.2.1. ST Study Method
Both of the following study methods are used for ST outage assessment:

- The AEMO EMS applications, Powerflow, CA, VSAT, Short circuit analysis and DSA.
- ST PASA reserve assessment.

8.2.2. ST Study Parameters

- Network configuration (including bus tie status) as advised via the NOS.
- Generation as per typical real time conditions with regard to availability in ST PASA (this includes semi-scheduled wind and solar farm generation output based on AWEFS and ASEFS forecast).
- Worst case generation pattern, including maximising generation in a particular power station or within a specific area if necessary.
- Any agreed specific generation condition advised by the TNSP via NOS.
- Any network limits advised by the TNSP via NOS.
- Any agreed network support agreement advised by the TNSP via NOS.
- Any arrangements included in a contingency plan advised by the TNSP via NOS.
- Demand will be 50% POE forecast.

8.2.3. ST Assessment Priority
The primary consideration with regard to priority is to provide assessment of all outages approaching pre-dispatch for security purposes. The secondary consideration is to provide outage related information to the market via standard AEMO publications. AEMO resources are committed full time to ST assessment functions; however response time may vary depending on workload at any time. The practical conditions influencing this include submission of Short Notice outages, the delayed notification of contingency plan and other outage detail, as well as assessment time committed to the more complex outage study cases.

8.2.4. ST Study Results
Results will indicate all issues and solutions detected during study such as:

- System security violations.
- Reserve issues.
- Restriction of specific generators.
- Contingency plans.

If all issues associated with an assessment have been addressed the outage status will be changed to STLTP in NOS.

8.3. Pre-dispatch Outage Assessment
PD outage assessment is more accurate than any previous study due to increasing certainty associated with dispatch of generators, demand and network configuration. As time approaches dispatch PD studies will obviously be extremely close to the situation during the outage.

8.3.1. PD Study Method
Both of the following study methods are used for PD outage assessment:

- The AEMO EMS applications, Powerflow, CA, VSAT, Short circuit analysis and DSA.
- Pre-dispatch reserve assessment.
8.3.2. PD Study Parameters

- **Network** configuration (including bus tie status) as advised via the NOS.
- **Generation** as per *pre-dispatch* schedule (This includes *semi-scheduled* wind and solar farm *generation* output based on AWEFS and ASEFS forecast). Note that arrangements made between a TNSP and generator to accommodate an *outage* should be reflected in the *pre-dispatch* schedule.
- Worst case *generation* pattern, including maximising *generation* in a particular power station or within a specific area if necessary.
- Any *network* limits advised by the TNSP via NOS.
- Any agreed *network support agreement* advised by the TNSP via NOS.
- Any arrangements included in a contingency plan advised by the TNSP via NOS.
- Demand will be the 50% POE PD forecast.

8.3.3. PD Assessment Priority

The primary consideration with regard to priority is to provide assessment of all *outages* approaching *dispatch* for security purposes. The secondary consideration is to provide *outage* related information to the market via standard AEMO publications. PD assessment is performed by control room staff and response time may vary throughout PD depending on workload associated with the real time operation of the *network* at any time.

8.3.4. PD Study Results

Results will verify all issues and solutions detected during previous study as well as identify and resolving any issues not previously detected.

If all issues associated with an assessment have been addressed the *outage* status will be changed to PDLTP in NOS.

8.4. Dispatch Outage Assessment

If system conditions do not change significantly the PD assessment may be used as a basis for providing PTP of *outages* at the *outage* start time. Otherwise a final check must be made using real time data immediately prior to *outage* start. The *outage* status will be changed to PTP in NOS when AEMO are satisfied that all associated issues have been addressed, including confirmation of:

- Any agreed *network support agreement* advised by the TNSP via NOS.
- Any arrangements included in a contingency plan advised by the TNSP via NOS.

If any *network support agreement* or contingency plan advised of by the TNSP via NOS are not in place and are required to ensure system security, the *outage* status should be changed to UTP.

8.5. Contingency Plans

A contingency plan is required to resolve any issue that is detected due to a *network* equipment *outage*.

If there are security violations and a contingency plan has not been provided, AEMO may phone or email to advise of simple issues or raise an issue in the NOS for more significant cases. In both of these scenarios the issue will be a summary of the violations that need to be addressed and information will need to be submitted by the TNSP.

Once an issue has been raised in NOS, an *outage* will not be assessed further until the issue is resolved. Planned *outages* that normally require a contingency plan should be submitted in the NOS with the contingency plan to reduce the possibility of delay during assessment.
The issue in NOS will be accompanied with a broad outline of the expected situation such as an indication of likely pre-contingent and post-contingent violations. Detail of the method employed to rectify violations is to be provided by the TNSP.

For contingency plans provided in the medium term only a preliminary plan may be possible in some circumstances as system conditions may be largely unknown, such a plan would be structured in broad terms and indicate the most probable contingency measures. Plans provided on this basis must be revised and made available to AEMO as soon as system conditions are considered to be more predictable, in any event detailed contingency plans should be available for the short term assessment carried out by AEMO.

A contingency plan may consist of a simple statement or may consist of detailed arrangements depending on the issues that need to be addressed. AEMO is responsible for the approval of contingency plans provided by a TNSP.

A contingency plan must include any arrangements made between a generator and TNSP to accommodate a network outage. The arrangement will then be reflected in the dispatch of generation. Any arrangements detailed in NOS that require a manual response from a generator will be confirmed with the generator by AEMO immediately prior to PTP.

8.6. Constraint Application

AEMO will apply constraints considered necessary to ensure that system security obligations are met at all times. This is simply a reflection of transmission network capability in the market system.

A significant amount of constraint application results from network outages advised to AEMO via NOS. The principle of constraint application with regard to NOS outage records is as follows:

- All constraints considered necessary to manage an outage advised via NOS will be invoked by AEMO at the earliest practical time. This includes constraints to reflect any network support agreement.

- Constraints using time based equipment ratings will only be applied if a contingency plan exists. The plan must detail the method of reducing equipment loading following a contingent event within the specified time to an appropriate value. For example the use of 15 minute transmission line ratings with an action plan to reduce loading post-contingency to within continuous rating within 15 minutes. This scenario may involve agreements between generators and NSPs.

- Constraints will be applied when an outage for NSP work has resulted in a reduction to the capacity of scheduled plant at its network connection. However, if the purpose of the outage is for work by the plant operator and not the NSP, then a constraint will not be applied to the plant. The intent is to indicate via network constraints, a reduction in network capability rather than a reduction in scheduled plant capacity. Bids and Offers are to reflect the level of the scheduled plant’s capacity. The zero MW constraint on the generator output should be invoked for the NSP outage, if the outage restricts the generation even if the outage is coordinated with the generator. However, in case of aggregated generators, constraints will not be invoked as it is not practical.

- Constraints will be invoked on embedded generators (Semi-scheduled generators only) connected to the DNSP network when there is an impact on TNSP equipment. When there is no impact on the TNSP network, constraints will not be applied. DNSPs should coordinate with generators and the generators should reflect the MW availability accordingly.
  - Due to limitations with AWEFS/ASEFS, the semi-scheduled generators were not able to directly bid their availability for dispatch. AEMO made changes to AWEFS/ASEFS to receive a
SCADA local limit and apply it as a cap of their dispatch forecast. The SCADA local limit is mandatory provision for new semi-scheduled wind and solar farms.

- If an NSP or generator informs AEMO of a restriction to semi-scheduled plant due to a network limit or internal limit not covered by turbine/inverter availability (e.g. DVAR limit), then AEMO should invoke a quick constraint to reflect this limit. The quick constraint description should state the reason for the limit (e.g. NSP limit or Participant advised limit).

- Constraints will not be applied for the testing of scheduled plant secondary systems when the plant is off line. The plant is required to arrange for correct (zero) indication to be available to AEMO at these times so that market systems do not respond to incorrect data.

- Constraints will not be applied for a reduction of capacity of non-scheduled wind or solar generation. Any limitations to the output of a non-scheduled wind or solar farm will be entered directly into the AWEFS or ASEFS forecasting system by AEMO.

- Constraint sets for single and multiple outages can be invoked concurrently except for cases where specific advice has been provided that the invocation of both constraint sets is not allowed.¹

9. NOS OUTAGE ACKNOWLEDGEMENTS

When submitting an outage there are six tick boxes for the TNSP to consider. Note – AEMO does not operate these tick boxes.

**Figure 4** NOS Outage Acknowledgements

<table>
<thead>
<tr>
<th>Information Only</th>
<th>Affected DNSPs aware</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project Work</td>
<td>Affected TNSPs aware</td>
</tr>
<tr>
<td>Unplanned Outage</td>
<td>Affected Generators aware</td>
</tr>
</tbody>
</table>

9.1. Information Only

Indicates the category of the outage is ‘Submit for Information’.

9.2. Affected DNSPs aware

The relevant DNSP is aware of an outage which may potentially impact on their network operation and has not raised any objection. Refer also to NER 4.10.3.

9.3. Affected TNSPs aware

The relevant TNSP is aware of an outage which may potentially impact on their network operation and has not raised any objection.

9.4. Affected Generators Aware

The relevant generator is aware of an outage which directly impacts on their connection to the network and has not raised any objection.

9.5. Project Work

Indicates the outage is for project work.

¹ AEMO’s internal constraint dictionary states clearly in the ‘constraint set name’, when single outage constraints are not to be invoked along with multiple outage constraints.
9.6. **Unplanned outage**
Indicates the outage was unplanned.

9.7. **NOS Outage Status**
This section explains the NOS *outage* status cycle. An overview of the cycle is depicted in Figure 5.

9.8. **Recall Time**
Recall Time is the time taken to completely restore the equipment to service (including switching time) when required. Appropriate recall time should be provided in the planned *outage* submission.
Figure 5  NOS Status Cycle

<table>
<thead>
<tr>
<th>NOS Outage Status</th>
<th>Task Undertaken</th>
<th>Action Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>Submit</td>
<td>MT Assessment Done, Violations Detected?</td>
<td>Issue Raised, TNSP Info Required</td>
</tr>
<tr>
<td></td>
<td>Include Info in other Tasks</td>
<td></td>
</tr>
<tr>
<td></td>
<td>INFO (Advice Only)</td>
<td></td>
</tr>
<tr>
<td>MTLTP</td>
<td>ST Assessment Done, Violations Detected?</td>
<td>Issue Raised, TNSP Info Required</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>STLTP</td>
<td>PD Assessment Done, Violations Detected?</td>
<td>Issue Raised, TNSP Info Required</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PCLTP</td>
<td>DS Assessment Done, Violations Detected?</td>
<td>Issue Raised, TNSP Info Required</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PTP</td>
<td>Examine Restoration, Problem Detected?</td>
<td>Resolve Problem</td>
</tr>
<tr>
<td>UTP</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PTR</td>
<td></td>
<td></td>
</tr>
<tr>
<td>COMPLETE</td>
<td>Completion Advised by TNSP</td>
<td></td>
</tr>
</tbody>
</table>
9.9. **Issues Raised**

The NOS has a facility to note issues that need to be resolved. This facility is used to log violations that have been observed during assessment. In general, if an issue has been raised then no further assessment will take place until the issue has been addressed. The record is essentially frozen until sufficient information is provided. Only when sufficient information has been included to resolve the issue will assessment continue.

An example of the process is depicted in Figure 6:

![Issues Process Diagram](image)

9.10. **SUBMIT**

The NOS status of SUBMIT indicates an outage has been submitted to AEMO for assessment. Assessment may have started, detail may be attached by AEMO but the appropriate stage of assessment has not been completed.
9.11. INFO

The NOS status of INFO indicates an outage has been submitted to AEMO “for information”.

9.12. MTLTP

The NOS status of MTLTP indicates the outage has been assessed in the MT timeframe and is likely to proceed. That is, with the MT assessment parameters available, no issues have been identified and given similar conditions the outage is likely to obtain PTP at the time of outage start.

9.13. STLTP

The NOS status of STLTP indicates the outage has been assessed in the ST timeframe and is likely to proceed. That is, with the ST assessment parameters available, no issues have been identified and given similar conditions the outage is likely to obtain PTP at the time of outage start.

9.14. PDLTP

The NOS status of PDLTP indicates the outage has been assessed in the PD timeframe and is likely to proceed. That is, with the PD assessment parameters available, no issues have been identified and given similar conditions the outage is likely to obtain PTP at the time of outage start.

9.15. PTP

The NOS status of PTP indicates AEMO has given the NSP permission to proceed with the network outage. It is based on the principle that AEMO has determined the transmission network will remain in a secure and reliable operating state.

For OOS Work, The TNSP must request PTP from AEMO immediately prior to the high voltage switching that will remove the load carrying capability of equipment.

For I/S Work, The TNSP must request PTP from AEMO immediately prior to disabling the service.

Due to possible changes on the network, PTP is valid for a maximum time of 15 minutes. If the impact on the network due to the outage has not been established during this time then the TNSP must discuss the situation with AEMO. PTP must be confirmed at this time.

PTP can only be provided by AEMO at the outage start time as it is governed by real time and expected conditions on the network. It may be based upon study done during the pre-dispatch period if system conditions have not changed significantly; otherwise PTP will be based on study prior to outage start. Any previous advice regarding likelihood of PTP is irrelevant at this time as real time information is used for this assessment.

The outage status will be changed to PTP in NOS when AEMO are satisfied that all associated issues have been addressed, including confirmation of:

- Any agreed network support agreement advised by the TNSP via NOS.
- Any arrangements included in a contingency plan advised by the TNSP via NOS.

If any network support agreement or contingency plan advised of by the TNSP via NOS are not in place and are required to ensure system security, the outage status should be changed to UTP.

9.16. UTP

AEMO may advise that an outage is Unlikely To Proceed at the time of outage start when system conditions are known with certainty. In some cases UTP may be advised at an earlier time if there is a low probability that an outage will proceed under the expected conditions.

Some conditions that may result in UTP at the time of outage start are:
• Issues raised in NOS that have not been resolved.
• A predefined condition for PTP has not been met.
• Unforeseen circumstances or previously unidentified issues have become apparent.

AEMO may advise UTP for outages of transmission network equipment based on the following:

• Where it would be necessary to issue a direction or a clause 4.8.9 instruction for the purposes of maintaining the power system in a secure operating state, a reliable operating state or for reasons of public safety.
• Forecast conditions are such that the planned outage(s) would result in power system security breaches or lack of reserve (LOR) conditions.

AEMO may advise UTP for outages of secondary equipment or in-service work based on the following:

• Where the outage would result in a significant disruption to the operation of the market due to the unavailability of metering services.
• Where the secondary equipment outage or in-service work would result in a significant disruption to the operation of the market and no satisfactory back-up arrangements are in place to minimise such disruption.
• Where the outage is not in accordance with the requirements of NER clauses 4.8.2(a), 4.6.5 or S5.12.1(d).
• The following conditions are not reasons for AEMO advising that a planned outage is unlikely to proceed:
• If during the planned outage there was to be an occurrence of a contingency event, which resulted in the power system being satisfactory but no longer in a condition considered to be secure on the occurrence of a further contingency event, then that is not a reason for UTP. An acceptable management plan in this case would be for AEMO to issue a direction or clause 4.8.9 instruction to return the power system to a secure operating state within 30 minutes.
• If the planned outage was the cause of negative residues, AEMO would not withhold permission to proceed, delay or recall the outage.

9.17. PTR

PTR is the acknowledgement that the NSP can restore the network outage. The network outage, including any associated high voltage switching, is expected to be complete immediately following PTR being provided by AEMO.

For OOS Work, the TNSP must request PTR from AEMO immediately prior to the high voltage switching that will restore the load carrying capability of equipment.

For I/S Work, unless otherwise requested, PTR from AEMO is not required. However, ‘Completion’ must be submitted without delay.

Due to possible changes on the network, PTR is valid for a maximum time of 15 minutes. If the impact on the network due to outage restoration has not been established during this time then the TNSP must discuss the situation with AEMO. PTR must be confirmed at this time.

9.18. Complete

The completion of the outage has been submitted by the TNSP, all equipment is returned to normal operating state.
9.19. **Withdrawn**

The outage is not required and ‘Withdrawal required’ has been submitted by the TNSP.

10. **CO-ORDINATION OF OUTAGES ACROSS REGIONAL BOUNDARIES**

Transmission lines in the NEM interconnected network can span different regions and therefore each end may be under the control of a different NSP or asset owner. This section is devoted to providing a clear process for AEMO to co-ordinate the outages of equipment across inter-regional boundaries and lines of asset ownership.

10.1. **Work at one end of an Interconnector Transmission line.**

Where an outage is submitted by a NSP for work on its end of a transmission line only, then this NSP is responsible for coordinating the switching of the line out-of-service after receiving Permission to Proceed from AEMO. The same applies for returning the line to service, after receiving Permission to Restore from AEMO.

10.2. **Work at both ends of an Interconnector Transmission line**

Where an outage is submitted for work on both ends of a transmission line by the different asset owners or NSP’s the following process will apply.

1) AEMO will nominate one of the two associated NSP’s to coordinate switching the line out of service. AEMO will verify the nomination, having previously entered a statement to this affect in the NOS notes section for each NOS entry at the PDLTP approval stage.

2) After receiving Permission to Proceed from AEMO, the nominated NSP coordinates switching the line out of service, advising AEMO that the line is out-of-service on completion.

3) Once the nominated NSP advises AEMO that the transmission line is out of service, the other NSP is given Permission to Proceed.

4) On completion of the work by both parties and after Permission to Restore is received from AEMO the nominated NSP coordinates the switching to return the transmission line to service.