

System Control Plant Outage Procedure



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1 Purpose of Procedure

This procedure specifies the processes:

- (a) Generators and Network Operator will use to plan, gain approval, and conduct planned plant outages,
- (b) Power System Controller will use to coordinate and sanction planned plant outage requests;
- (c) Generators, Network Operator, and Power System Controller will use to manage forced outages;
- (d) Generators, Network Operator, and Power System Controller will use to assess and manage emergency performance issue outages required for safety of people or plant, or to manage plant performance issues impacting system security or system reliability;
- (e) Generators, Network Operator, and Power System Controller will use to return equipment to service following an outage.

2 Scope

This document is produced to provide clarity to all System Participants, and is intended to be read in conjunction with the System Control Technical Code (SCTC) and Secure System Guidelines (SSG). Terms defined in these documents are not defined herein. Some references are provided to these documents for convenience only.

The Power System Controller is responsible for coordinating and sanctioning all plant outage requests (SCTC 2.2 c). The procedure applies to generation, transmission, or distribution plant connected to the Darwin Katherine and Alice Springs regulated power systems for which the Power System Controller determines that coordinated outage scheduling is required to manage the risk to system security or system reliability.

This includes generators, black start facilities, equipment providing voltage control or ancillary services including batteries and capacitors, any part of 132kV and 66kV transmission systems, 22kV and 11kV distribution system equipment connecting power stations or zone substations, power station or zone substation buses, nodes, and transformers. It also applies to switchgear, protection systems, auxiliaries, communication network, and control system for any such equipment.

Where potentially commercial-in-confidence information is necessary to ensure the application of this procedure is significantly clear, the relevant information will be added to the applicable Operating Protocol or Service Level Agreement in place between System Control and individual System Participants.

For further understanding or resolution of issues relating to this document, refer all matters to the Power System Controller (and any dispute shall be governed according to Clause 1.5 SCTC).

3 General Approach

System Control will not approve any outage activities if:

- (a) there is reason to believe that there is a safety risk to personnel, members of the public, or equipment,
- (b) result in a breach of the Reactive Power Reserve requirements (SSG Section 13),

- (c) result in a breach of the Standby Reserve requirements (SSG Section 13),
- (d) result in equipment ratings being exceeded,
- (e) result in customer load shedding,
- (f) that it assesses will result in an unacceptable risk to system security risk or system reliability,
- (g) insufficient information is supplied for the System Controller to conduct an assessment,
- (h) submission timeframes are not met, and therefore there is not sufficient notice for the Power System Controller to complete the assessment.

The Power System Controllers approval assessment will include consideration of a credible contingency event (SSG Section 3) occurring during the period that the outage occurs, and the required actions to return the power system to a secure operating state within thirty minutes following the credible contingency.

Where System Control requests additional information to assess outage applications, a System Participant must provide the information as soon as practical, and within the timeframe specified. Where the required information is not received, the Power System Controller may reject the application and the System Participant required to resubmit.

Approval of Long Term and Medium Term outage plan submissions by the Power System Controller does not grant approval for specific outage dates and times. Outage dates are not approved by the Power System Controller until the Outage and Testing Request (OTR) is approved and risk notice issued in accordance with the Short Term Planning process. Where a System Participant requires outage dates to be approved with additional notice in order to complete detailed planning such as contractor bookings and travel arrangements, it is the responsibility of the System Participant to submit their Medium Term and Short Term planning submissions earlier than the minimum dates, taking into account the Power System Controller response times outlined within this procedure time frames.

In accordance with the Northern Territory Electricity Ring Fencing Code, the Power System Controller is to conduct its business without discriminating against another Electricity Entity. Long, Medium, and Short term outage planning requested by System Participants will be assessed and approved in the order in which it is received. In the event that two System Participants submit requests for competing outage windows, the request received at the earliest date and time will be accepted. The only variation to this prioritisation is where a risk to safety, power system security, or power system reliability is identified.

For the removal of doubt, any reference in this document to Outage and Testing Request (OTR) applies to:

- (a) Generation Outage and Testing Request (GOTR) electronic form required to be completed by Generator Participants; and
- (b) Request For Access (RFA) electronic form required to be completed by Network Operator or Network Users.

4 System Risk

4.1 Elevated Risk Outages

Scheduling of outages that pose elevated risk to power system security or power system reliability will require additional planning. Outages for which any of the following apply are referred to in this document as having elevated risk, and additional requirements are applicable:

- (a) classified as protected equipment (SSG Section 3);
- (b) likely to take longer than 3 days;
- (c) plant affects output of more than one generator unit e.g. power station bus or combined cycle steam turbines;
- (d) disrupts 132kV or 66kV transmission feeders;
- (e) disrupts 22kV or 11kV distribution feeders connecting substations or power stations;
- (f) requires customer load shift of more than one distribution feeder;
- (g) will require a generic system constraint or network constraint;
- (h) activity has previously resulted in a power system event;
- (i) planned to be undertaken during the wet season if connected to the Darwin-Katherine power system;
- (j) planned to be undertaken during summer or winter if connected to the Alice Springs or Tennant Creek power systems; or
- (k) if advised by System Control.

If a System Participant is not sure if an outage or works will change the risk profile for power system security or power system reliability, they will contact System Control Operations Planning Team via the communication paths specified in their relevant Operational Protocol or Service Level Agreement.

4.2 System Risk Assessment

When considering the conditions in which an outage can proceed, the Power System Controller conducts a detailed risk assessment that considers likelihood and consequence of the possible N-1 contingency events occurring, and for extended outages, N-2 contingency events. In some cases, non-credible contingency events may be considered if the Power System Controller reclassifies them as credible contingency events due to the plant being taken out of service.

The likelihood of a contingent event occurring is based on an assessment of the historical frequency of contingency occurring, disabling of protection systems or auto reclose functionality, weather forecast, monitoring mechanisms and ability to stop works if weather conditions change, the duration of the outage and percentage of time customers are exposed to risk, concurrent work increasing the likelihood of a contingency event occurring, the level of mitigation in place for concurrent work, and the potential exposure under frequency load shedding.

An assessment for consequence is undertaken with due consideration to the impact to customers, the number of customers at risk, the classification of customers affected, confidence in load forecast accuracy, number of customers that can be restored in a short duration, length of time to restore all customers, the type of outage (continuous, cyclic, rotational), work recall time to return the plant to service.

Typically the Power System Controller will work with System Participants to establish mitigation measures for the outage that will aim to bring the Residual Risk Score to 'System Normal'. If this Residual Risk cannot be mitigated the Power System Controller may reschedule, or cancel the outage.

The Power System Controller may permit outages with undesirable residual risk scoring in the cases where it assesses that the risk to power system security or power system reliability to be higher if the works associated with the outage do not proceed.

5 Long Term Outage Planning

5.1 System Participant Annual Plant Maintenance Forecast Submission

System Participants are required to submit an Annual Plant Maintenance Forecast to the Power System Controller (SCTC 6.10). The Maintenance Outage Plan shall include (a) the maintenance programme for the System Participants plant for the following financial year, and (b) an indicative maintenance programme for each of the 3 subsequent financial years.

Annual Plant Maintenance Forecasts shall include a brief overview of the work to be completed, the extent of the plant to be taken out of service, an estimate of the time to complete each outage, and preferred window for the outage to be scheduled.

Where multiple System Participants are requesting the same windows in the Annual Plant Maintenance Forecasts, the Power System Controller will undertake coordination between parties to reach agreement. Where an agreement between two parties cannot be met, the Power System Controller will make a decision and advise both parties. While it is understood that not all activities can be scheduled ahead of time, this process should capture all known planned maintenance and capital work of elevated risk. The Power System Controller will use these plans to hold the selected dates for the requesting party. In order to ensure outage windows are optimised for all System Participants, plans should be resubmitted when dates are changed. System Participants are encouraged to resubmit Annual Plant Maintenance Forecasts quarterly. Where required, or on request, System Control will undertake quarterly outage coordination meetings with System Participants in which the outlook for the rolling 12 months outages is discussed.

5.2 Annual Plant Maintenance Forecast Response

Following the receipt of an Annual Plant Maintenance Forecast, the Power System Controller shall review and provide a response in line with SCTC 6.10.3. The Power System Controller will indicate in the response the outages which classify as elevated risk outages and will therefore require preliminary assessments to be submitted.

When the Power System Controller conducts the long term planning assessments the response will indicate the most likely window the outage will proceed, and indicate if generation or network constraints will be required. The Power System Controllers response will also provide an indication of the outages for which it will require detailed contingency plans and test plans. The assessments at this stage will be based on the best available information, however there are a number of uncertain study variables, notably generation and system configuration and availability, as well system demand that are required to be reassessed during the medium and short term planning.

6 Medium Term Outage Planning

6.1 Preliminary Assessment Submission

Outages of elevated risk to system security or system reliability will require more detailed assessment, modelling, contingency planning, and potential constraint application. In order to provide System Participants with ample time to prepare, preliminary assessments will be submitted in writing to System Control Operations Planning with a minimum 30 days' notice. Preliminary assessment requests will include all the details relevant to a formal OTR, a risk description for the outage and likelihood of outage extension, steps to be taken to mitigate the risk pre and post contingency, and a detailed test plan for any online and/or compliance testing activities.

On receipt of an approved preliminary assessment, the System Participant shall submit a formal OTR.

6.1.1 General information

Specific detail on how the work is to be conducted is generally not of use to the Power System Controller. Information submitted by System Participants shall be concise and targeted to the needs of assessment. Information of any equipment rating changes or other variables that will require changes to the Power System Controllers power system models, HV isolation points of the equipment to be taken out of service, proposed control system changes, protection settings changes, SCADA and communication network changes, AVR or governor changes must be detailed in the preliminary assessment submission shall be provided to the Power System Controller.

6.1.2 Recall time and contingency plan

An outage contingency plan shall indicate the high-level steps the System Participant will follow should the Power System Controller require the early return to service or partial return to service of plant. For a Generator, contingency plans shall consider conditional return to service of generator units with restricted output or control. For the Network Operator, contingency plans shall consider equipment bypass, partial restoration, temporary generator installation, alternate supply arrangements, alternate protection settings, and short term equipment ratings.

6.1.3 Test plan

The System Participant shall provide a high level test plan for all non-routine testing such as load rejection testing or compliance testing. Additionally, for generator reliability run, the proposed generation outputs shall be detailed such that the Power System Controller can outline the system loading and constraint requirements for each testing increment.

6.2 Preliminary Assessment Response

The Power System Controller will consider the 30 days' notice period to commence when all required information is received. If the submission lacks the required detail, or the documentation is too extensive, the Power System Controller will reject the application and request resubmission.

The Power System Controller will endeavour to provide a response within 14 days, indicating the requirements for an OTR to be approved, the agreed dates, acceptance of the proposed contingency measures, test plans, and other required supporting documentation.

The preliminary outage assessment will use a number of uncertain study variables for generation and network configuration, plant availability, and demand forecasting. The Power System Controller will utilise best estimate based on historic data and known information of these and other variables when undertaking the assessment, however it is noted that these and other variables can greatly impact the system security assessment.

7 Short Term Outage Planning

7.1 Outage and Testing Request Form Lodgement

7.1.1 Out of service – plant disconnected from the system

System Participants shall submit final Outage / Testing Request (OTR) to the Power System Controller with the minimum notice period specified in SCTC 6.5.2(e). Outages received with less than the minimum notice will only be considered if the Power System Controller deems that the outage is unavoidable according to the emergency performance issue outage or forced outage criteria in Section 8 of this document.

When completing the outage and testing request form, System Participants shall complete the form in full, including high level explanation of the works to be undertaken, plant / equipment affected, duration of outage, recall time of outage if applicable, and contact details of the requestor. When a System Participant submits an OTR, it shall be accompanied by the outage risk assessment, contingency plan, and test plan where identified during the long term or medium term planning stages.

Planned online testing that is to occur while the plant under test is connected to the power system requires an OTR to be submitted with details of the online testing activities and the risks associated with the work.

7.1.2 In service work - generator online testing

Generators shall use the testing section of an OTR for any online synchronisation or testing to be conducted either during a planned outage, or on completion of a planned outage prior to return to service. Generators shall include the specific details of the desired testing outputs to be tested, including ramping actions. A generator shall submit a final test plan to accompany any non-standard and/or uncommon tests such as load rejection tests and mapping.

7.1.3 Generator opportunistic maintenance

Generator plant outages of less than 24 hours, with a recall to service time of less than 15 minutes may be approved at short notice on the day via verbal approval from System Control Hudson Creek Control Room. Opportunistic maintenance will be considered the lowest priority outage, after all long term, medium term, and short term planned outage, as well as unplanned outages. Typically opportunistic maintenance process would apply to plant inspection or testing activities of a non-intrusive nature only in order for the 15 minute recall time to be met.

Opportunistic maintenance verbal approval is granted on the condition that the plant can be called into service should the Power System Controller deem necessary as the result of an unplanned outage or change in system security or system reliability risk. Approval of opportunistic maintenance on the

day does not affect pre-dispatch merit order, the unit will be called into service according to the pre-dispatch merit order.

7.1.4 Request for network access

PWC network isolations are coordinated by the Power System Controller and field switching carried out by the Network Operator. System Participants shall include PWC Network Performance in any OTR correspondence where PWC assistance for isolation is required, in accordance with the applicable Operations Protocol or Service Level Agreement.

7.2 Outage Assessment and Notification

7.2.1 Outage assessment

Short term outage assessment includes the use of more reliable generation and network configuration, plant availability forecast, and demand forecasts.

The System Control outage and testing assessment process relies upon the information provided by System Participants of changes to their plant. A detailed risk assessment and risk notification can only occur if accurate information is provided by the System Participant in a timely manner.

If an outage is not approved, the OTR will be returned with the reason for not being approved.

If an outage is approved, the OTR will be returned with Power System Controller sign off and a copy of the Risk Notification / Generator Constraints document which details the outcome of the assessment including:

- details specific to the outage,
- impact on market pre-dispatch,
- effects on the power system N-1 contingency events,
- actions to be taken prior to commencement of the outage,
- pre-contingent generation constraints,
- system conditions required to be met in order for the outage proceed,
- risk description and summary of contingency plans in place,
- details of the customer numbers at risk,
- assumptions made in the system study,
- System risk assessment.

7.3 Outage Commencement Authorisation

The conditions for a planned outage proceeding on the day are documented on the Risk Notification. System Participants shall contact System Control Room prior to the commencement of any planned outage, and receive verbal authority to proceed. If the conditions noted on the Risk Notification are not met, or an unforeseen event has resulted in a change of the risk profile for system security or reliability, the outage will not proceed at the time of the event.

8 Planned Outage Changes

8.1 Cancellations

Where a System Participant no longer intends to proceed with a planned outage, it must inform the Power System Controller via email, with the email subject “Cancellation – (OTR Number)”.

If a System Participant becomes aware of any changes to the information previously provided to the Power System Controller related to an long, medium, or short term assessment then they must submit a revised plan in full as soon as practical.

The Power System Controller may cancel an outage that has been previously formally approved. In this case the Power System Controller shall notify the nominated contact of the affected party of the cancellation decision. The circumstances in which Power System Controller will cancel previously approved planned outages or testing include:

- (a) Changes in load forecast
- (b) Changes in weather forecast during the planned outage period resulting in an increase in demand or increased likelihood of a contingency event occurring
- (c) Unplanned outage of another item of plant placing revised constraints
- (d) Unplanned outage of another item of plant placing the system into a lack of standby reserve
- (e) Unplanned outage of another item of plant resulting in inadequate reactive power reserve
- (f) Conditions in the Risk Notice not satisfied

8.2 Extension of Planned Outage OTR

A System Participant must resubmit an OTR as soon as possible when it foresees a planned outage extending beyond the previously approved date and time. The OTR shall be submitted with the original OTR number, and the reason for extension.

OTR extensions must be submitted prior to 12:00 on the outage end date of the previously approved OTR. Failure to do so will result in the submission being considered a forced outage for market dispatch and reporting purposes.

At least one working day is required for System Control to formally produce a revised Risk Notification. If one working day notice is not provided, there may be delays in approval of testing activities.

8.3 Revision of Planned Outage OTR

A System Participant shall submit a revised OTR for a planned outage when any details contained in the approved OTR are altered. This includes changes or expansion of the work to be undertaken or revisions to online testing requirements.

If the changes to online testing requirements differ from the test plan substantially, the Power System Controller may require the full OTR approval notice period to complete the assessment.

If the Power System Controller assesses the revision to not change system security or constraints application, the revised OTR may be approved without issuing a revised risk notice.

9 Unplanned Outages & Testing

Unplanned outages, be they forced or emergency performance issue outages, are excluded from the 10 day notice period for OTR submission.

9.1 Performance Issue Outage

A performance issue outage is considered to be an unplanned outage that is requested by the System Participant or the Power System Controller due to a potential impact to system security (SCTC 6.5.1). Where the risk to safety or system security is identified as immediate, System Participants shall notify the System Control Hudson Creek Control Room via phone immediately. The Power System Controller will direct instructions to adjust dispatch and/or remove from service. The System Participant shall submit an OTR as soon as practical after the risk is managed.

Performance issue outages may often result in a generation unit curtailment or constraint being applied, not necessarily taken offline. The treatment will be determined by the Power System Controller based on system security risks and system conditions.

A performance issue outage OTR is required for generator plant that is not performing at its registered minimum stable load or base capacity, not following the dispatch target issued by System Control, or which is identified as non-compliant for forecasting accuracy (refer Generator Forecasting Compliance Procedure).

9.2 Forced Outage

A forced outage is classified as an unplanned outage as a result of an unplanned disconnection from the system (trip or emergency controlled shutdown), or plant fails to start and/or synchronise to the power system when called into service.

9.2.1 Forced outage of generation plant

For generation plant, in the first instance, the Generator must notify the System Control Hudson Creek Control Room via phone immediately of the known or likely cause, and that the plant is to be considered unavailable. Following verbal communication, the Generator must submit an OTR formally communicating the details using the worst case duration of the outage while the fault / cause of outage is under investigation.

When subject to an unplanned outage, isolation, inspection, and repair work on generation plant involved in a forced outage can commence following verbal agreement with the Power System Controller, it is not necessary to wait for approval of an OTR.

9.3 Extension of unplanned outage

A System Participant shall submit a revised OTR to the Power System Controller when the any details contained in the approved OTR are altered. This includes changes or expansion of the work to be undertaken or revisions to online testing requirements.

A System Participant must resubmit an OTR as soon as possible when it foresees an unplanned outage extending beyond the previously approved date and time. The OTR shall be submitted with the original OTR number, and the reason for extension. Where possible, OTR extensions should be summited prior to 12:00 on the outage end date of the previously approved OTR in order to be included in the Market pre-dispatch.

9.4 Testing following Performance Issue or Forced Outage

It is the responsibility of the System Participant to conduct testing of its plant prior to return to service following Performance Issue or Forced Outages. In many cases this will involve synchronisation to the power system and online testing. The System Participant shall resubmit a revised OTR, referencing the assigned OTR number, with the details of the online tests to be performed at each desired testing output, including ramping actions.

9.5 Power System Controller unplanned outage treatment

When subject to an unplanned outage, isolation, inspection, and repair work on plant involved in a forced outage can commence following verbal agreement with the Power System Controller, it is not necessary to wait for approval of an OTR. However, at no time should testing or synchronising occur without the OTR approval and verbal authorisation from System Control Hudson Creek Control Room is received.

The Power System Controller will approve the OTR for forced outages as soon as practical. Formal Risk Notifications will be issued for forced outages during business hours if the outage is likely to exceed 24 hours.

As with planned online testing, unplanned online testing will require system load and conditions to be met, and therefore wait times should be expected. When a System Participant requires testing of plant prior to return to service, the Power System Controller will accommodate OTR's for testing, with prioritisation given to planned testing and switching activities, unless power system security or reliability risks require prioritisation of returning the equipment under unplanned outage priority.

10 Return to Service

10.1 Return to Service Submission

All planned or unplanned outages require a return to service (RTS) application form to be submitted to the Power System Controller when works are complete and the plant is ready to be returned to service.

The System Participant must include the OTR number provided when the outage was approved, the likelihood of the machine tripping, the cause identified and/or details of work undertaken, results of testing undertaken, and any operational restrictions to be applied.

10.2 Return to Service Approval

The Power System Controller will not approve the RTS if the details are incomplete, or if it is not satisfied that the risks of tripping have been rectified. The RTS form must be submitted and approved prior to the machine being synchronised to the power system, considered available for service, or being considered for standby reserve.

11 OTR and RTS Distribution

OTR and RTS forms related to generation capacity are distributed to all participants registered in the relevant power system on approval by the System Controller. The information submitted by the generator as part of the OTR or RTS form lodgement is included as part of this circulation. If a generator considers information accompanying their submission to be confidential, then they should provide this information in the email text rather than the form itself.

12 Communication Methods

- All generation outage and testing requests are to be submitted via Power System Controller's nominated Generation Outage Testing Request tool.
- All network outage and testing requests are to be submitted via Power and Water's Request for Access tool.
- All return to service requests for generation are to be submitted via the Power System Controller's nominated Return to Service tool.
- Annual Plant Maintenance Forecasts and Preliminary Assessment Requests are to be submitted to the Operations Planning generic email address:

SCOperationsPlanning.PWC@powerwater.com.au

With the purpose of the email clearly indicated in the email subject as "Submission of Annual Plant Maintenance Forecast" or "Request for Preliminary Assessment"

- Network access requests shall be submitted to the PWC Network Performance generic email address:

NetworkPerformance.PWC@powerwater.com.au

- For communication for other purposes, the primary methods of communication between a System Participant and System Control (Operations Planning and Real Time Operations divisions) is to be in accordance with the applicable Operational Protocol in place between the two parties.

13 Review

This document is to be reviewed in accordance with changes to the System Control Technical Code and/or the Network Technical Code.

System Participants can submit proposals for amendment to this procedure in writing to the Power System Controller.

14 Document History

Date of Issue	Version	Prepared By	Description of Changes
09 July April 2020	Draft	Amelia Farmilo	For Consultation