Audit of Powerlink service standards performance reporting 2008

March, 2009

Australian Energy Regulator

Parsons Brinckerhoff Australia Pty Limited ABN 80 078 004 798

Level 7, 457 St Kilda Road
Melbourne VIC 3004
PO Box 7209
Melbourne VIC 8004
Australia
Telephone +61 3 9861 1111
Facsimile +61 3 9861 1144
Email melbourne@pb.com.au

NCSI Certified Quality System ISO 9001

2117593A

Author: Peter Walshe

Reviewer: Mick Walbank

Approved by: Peter Walshe

Signed: 

Date: 20 March 2009

Distribution: AER

Contents

Contents (continued)

Page Number

List of tables

List of figures

List of appendices

Executive summary

Parsons Brinckerhoff (PB) has been engaged by the Australian Energy Regulator (AER) to undertake an audit of Powerlink's compliance with the service standards incentive scheme established by the AER in its 2007 revenue cap decision.

The audit includes:

- a review of the recording and reporting systems
- a substantive review of performance and exclusions.

The audit covers transmission service performance for the period 1 January 2008 to 31 December 2008.

Recording and reporting systems

PB found the Powerlink system for the recording, processing and reporting of service standards to be a robust and reliable system, free from material errors.

Exclusions

Powerlink propose to exclude the impact of 23 events from the calculation of the service incentive factor (s-factor) under the force majeure and third party exclusion criteria.

PB considers that all of the exclusions proposed by Powerlink meet the criteria for exclusion.

Performance calculations

PB considers Powerlink's calculation of its s-factor to be free of errors, and confirms that the financial bonus for Powerlink under the AER Service Standards Scheme for 2008 is 0.5329% of the Annual Revenue for the period.

PB notes that the calculations in the AER spreadsheet are not protected in those sheets that perform the calculation of the s-factor. PB recommends that the calculations within the spreadsheet be protected to prevent accidental changes.

1. Introduction

Parsons Brinckerhoff (PB) has been engaged by the Australian Energy Regulator (AER) to undertake an audit of Powerlink's compliance with the service standards incentive scheme established by the AER.

The audit covers service performance for the period 1 January 2008 to 31 December 2008. The service standards incentive scheme relevant to the 2008 period is as set out in the AER's *Decision, Powerlink Queensland Transmission Network Revenue Cap 2007–08 to 2011–12*, issued 14 June 2007. The decision was subsequently incorporated into the *Service Target Performance Incentive Scheme* (STPIS) version 01, dated August 2007.

The auditor is required to undertake a detailed review of the service standards submissions from Powerlink, which includes:

- a review of the recording and reporting systems
- a substantive review of performance and exclusions.

2. Review of recording and reporting systems

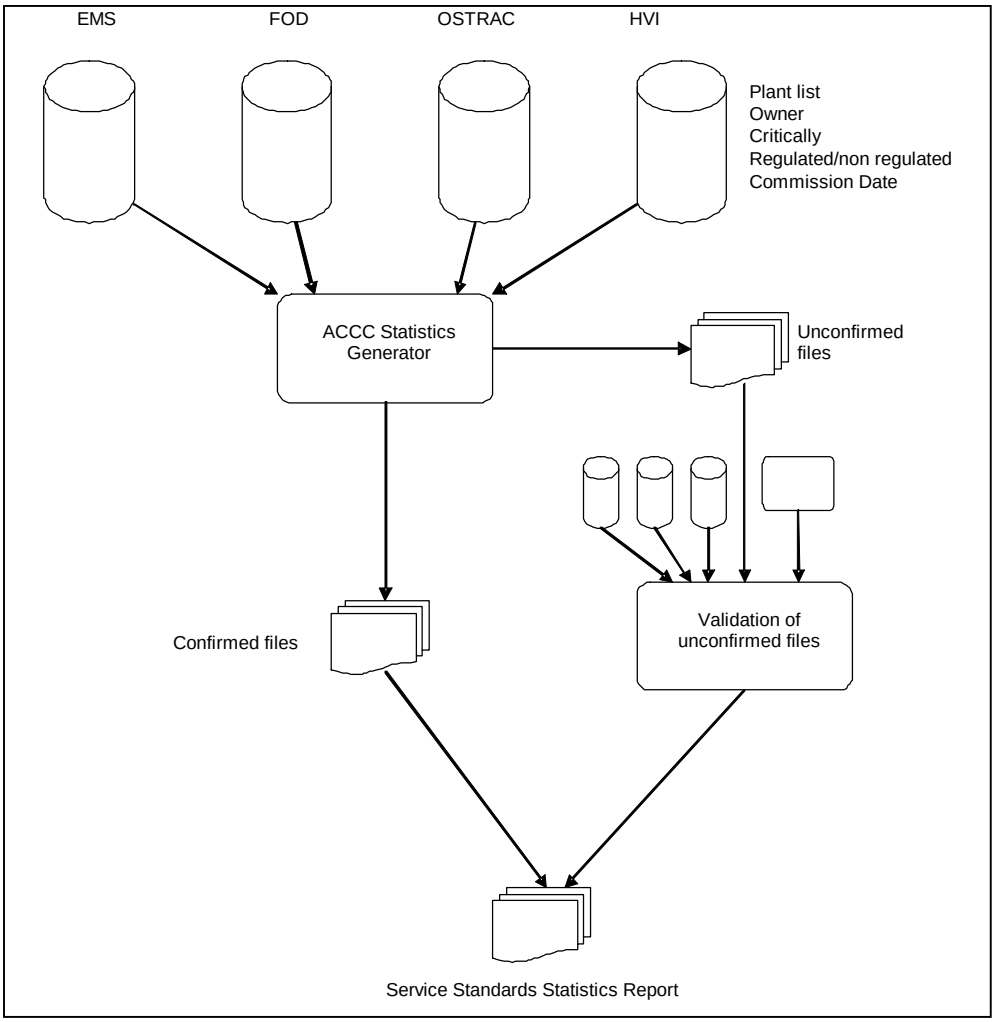
This section of the report sets out the results of the audit of Powerlink's system for recording and reporting of network events that are used in the calculation of the service standards factor (s-factor). An overview of the recording and reporting system is provided, followed by a report on the three main stages of the system:

- inputs to the system and where these inputs are derived
- the processing of the information to establish the service standard
- the processes in place to report to the AER the required information.

2.1 Overview of the recording system

An overview of the Powerlink data reporting system is illustrated in Figure 1.

Figure 1: Representation of Powerlink's reporting system for service standards



Source: Powerlink

Powerlink stated that it has not modified its performance data capture and processing system from that used in previous years. This is supported by the Powerlink procedure,

which indicates no revisions have been made[1], and a comparison with the data capture and processing system as set out in the 2008 audit report[2].

As the performance data capture and processing system has been fully described in the previous audit report, only a brief description is provided here.

The focal point of the performance recording system is an Oracle forms based program referred to by Powerlink as the 'ACCC Statistics Generator'. Data is fed into the ACCC Statistics Generator through four sources:

Energy Management System (EMS) – The EMS is an event capture database where all outage events are recorded either from direct SCADA input or from system operators. All data is automatically tagged with date and time information. System operators have the ability to tag an event with a comment to describe an outage in more detail if it is considered appropriate.

Forced Outage Database (FOD) – FOD consists of data files that provide details of all unplanned plant outages that occurred during a specific month. The raw data in the FOD provides details pertaining to each unplanned event, including a unique plant identifier, outage cause category, outage start/end date and time, brief comments of what occurred and was observed during the incident, the organisation responsible for the outage (e.g. Powerlink, distributor, customer or generator).

Planned Outage Database (OSTRAC) – OSTRAC contains data related to all planned outages for a specific month. To be included in this database, an outage must have been started or finished in the month in question, must relate to work undertaken on Powerlink assets, and must involve switching of High Voltage (HV) plant. An Application for Work (AFW) is raised within the system by the field group and the associated planning and switching details are added. The data in OSTRAC includes information about the substation or feeder which the AFW was raised against, item of plant the AFW was raised against, a description of the item of plant (e.g. capacitor, feeder, reactor, Static VAR Compensator (SVC) and transformer), work code and work code description, (e.g. line and substation work, line/underground (UG), live line work, live substation work, maintenance/repairs of HV infrastructure, protection work, etc), the planned start / end date and time (including peak / off-peak periods), impact on the network and the organisation that the outage is assigned to (e.g. Powerlink, distributor, customer or generator).

High Voltage Index asset list (HVI) – HVI is a plant register that contains data on each asset, including critical / non-critical categorisation, regulated / non-regulated status, and commissioning date.

Data from the four source databases — EMS, FOD, OSTRAC, and HVI — is compiled within the ACCC Statistics Generator. Firstly, data from the EMS is analysed to identify the start and end times of an outage. The ACCC Statistics Generator assumes that plant becomes unavailable when it is de-energised or, in the case of feeders, open-ended. The start and end times are then compared to data from FOD and OSTRAC and a match made if the times align within a certain range. In Powerlink's experience, reliable matches are obtained with a range of 5 minutes, which allows for potential differences between the actual operation time registered by SCADA devices within the EMS and those manually entered

[1] Powerlink, 2008, AER Statistics Preparation and Maintenance. Last revised in Feb 2008 to incorporate suggested improvements by auditor SKM. No change to the data recording process occurred.

[2] SKM, 2008, Audit of Powerlink Service Standards Performance Reporting

times in FOD or OSTRAC. Outages that have a match are recorded in a “confirmed” file that contains all required details from FOD, OSTRAC and HVI. Data from the confirmed file is cut/paste into the Service Statistics Report spreadsheet.

Outages that do not have a match are recorded in an “unconfirmed” file, which is manually checked. Each valid outage is marked as “ok”, event details added and the outage information cut/paste into the Service Standards Statistics Report spreadsheet.

An exception in the case of OSTRAC data is the switching of reactive plant. Such plant is most often switched for operational reasons, which does not require reporting under the service performance scheme. All SVC outages are automatically placed in the “unconfirmed” file, in order to allow for the determination of whether the SVC was switched for operational reasons or was actually made unavailable. For other types of reactive plant, Powerlink does not attempt to manually match the switching of reactive plant with planned outages in OSTRAC, due to the large number of switching operations that typically occur.

Other examples of the types of circumstances that may arise that may cause an “unconfirmed” file include a planned outage that did not proceed, and where multiple plant items were involved. An example of the latter would be where a line/transformer outage occurred but an associated capacitor bank, which has become unavailable as a result and was identified as unavailable by the ACCC Statistics Generator, was not separately recorded in OSTRAC or FOD.

The AER Service Standards Statistics Report is an Excel file, into which confirmed data from the Matching files are copied and pasted into worksheets for each month, together with data related to outages that have been separately investigated in the exception data files. The compiled data is analysed using standard Visual Basic macros to generate results for each of the parameters, both with and without proposed excluded events.

The AER Service Standards Statistics Report is generated internally on a monthly basis. This report is then circulated to relevant management personnel for comment and further scrutiny.

2.2 Inputs to the system

PB established that between 1 January and 31 December 2008, 1564 circuit elements were affected by planned or forced outages.

Data sampling was undertaken to confirm the accuracy of the data inputs to the recording and reporting system. PB notes that audits in previous years of the Powerlink reporting system have not identified any errors. For instance:

- In 2007, SKM conducted random sampling of thirty (30) individual events to ensure they had been captured and appropriately categorised. In each instance, SKM was satisfied that the information had been correctly recorded and processed.
- In 2006, PB examined the data collection process for the AER’s revenue cap review process, stating ”Although the data collection and reporting system established by Powerlink relies on some manual input and manipulation of data, we have found the process to be robust”.[3]

[3] PB, 2006, Powerlink Revenue Reset, Review of Capital Expenditure, Operating and Maintenance Expenditure and Service Standards, p. 179

In this audit, minimum sampling of events was undertaken to confirm the previous audit results. In addition, the audit included a number of additional checks to confirm the accuracy of the input data. The checks included:

- Three individual events selected at random from the "confirmed" files—an SVC outage, a forced line outage and a planned transformer outage— were compared to the data in FOD/ OSTRAC and EMS. No errors were identified.
- SCADA records from the EMS were examined for the 3 March 2008. Filtered to exclude alarms, 1896 records were examined and compared to the three recorded outages for this date. No errors were identified.
- A copy of the HVI was examined to confirm that the classification of circuit elements was appropriate.

In each case, the data was examined to ensure that the reportable outages had been captured and appropriately categorised. PB found that the assignment of the various descriptors was appropriate and accurate and that the data had been transcribed from the input systems without error.

A copy of the HVI was obtained in spreadsheet form and compared to the same file for 2006 as provided by Powerlink at the time of its revenue submission. The spreadsheet contains records from January 2002, with new and decommissioned assets clearly identified. Some plant has been reclassified from non-critical to critical in accordance with Powerlink's procedure for classifying its plant. The HVI is used to calculate the total number of possible circuit hours for the availability parameters. In PB's view, the data in the HVI is robustly presented and suitable for this purpose.

2.3 Processing system

PB observed the real-time operation of Powerlink's performance data outage monitoring system during its site visit and was satisfied that the system appeared to function as designed.

The arithmetic functions on the Excel spreadsheet "AER Service Standards Report" were checked and found to have been correctly constructed and applied. The seven day cap on average outage duration is also applied within the spreadsheet. PB confirms that the cap was correctly applied.

Some data in the AER Service Standards report must be manually updated. PB checked the data for maximum demand, public holidays and the count of critical, non-critical and total plant availability for each month. No errors were found.

Powerlink has a number of internal checks that occur prior to its internal monthly business reporting process. These checks include those that operate within the Excel spreadsheet via cell formatting operations and through a process of manual review of the classifications assigned to network outages and the identification of valid exclusions. PB confirms that these internal checks are carried out by persons knowledgeable about service performance reporting and appear appropriate.

PB also checked the spreadsheet formulae used to calculate the s-factor and confirmed that they correctly meet the definitions for each parameter.

2.4 Reporting system

Prior to the site visit, Powerlink resubmitted the template to amend the classification of an event that extended across more than one month. Powerlink were able to demonstrate to PB the need for the amendment and that no other amendments were likely to be required.

PB confirmed that the s-factors calculated in the AER Service Standards Report are the same as reported to the AER in the revised reporting template.

2.5 Summary

PB found the Powerlink system for the recording, processing and reporting of service standards to be a robust and reliable system, free from material errors.

3. Exclusions to the performance scheme

In this section PB examines the ability for Powerlink to accurately identify and record exclusions to the performance incentive scheme.

3.1 Accuracy

Powerlink propose to exclude from the calculation of the s-factor the impact of 25 outages that resulted from 23 events. Five events were classified as force majeure and the remainder as third party. PB examined each outage and event to determine whether they met the requirements of the exclusion criteria.

PB found that:

- 20 outages caused by 18 third party events were appropriately classified
- 4 outages due to industrial action force majeure events were appropriately classified
- 1 outage due to a storm force majeure event was appropriately classified.

Each of these is discussed below.

3.1.1 Third party events

PB checked each outage description and found no inconsistency with the outage being directly caused by a third party, as defined in the AER's 2007 revenue cap decision.

3.1.2 Force majeure events due to industrial action

Powerlink experienced impacts due to industrial action during 2008. For each outage event impacted by the industrial action, Powerlink estimated the most probable outage time that would have occurred in the absence of industrial action and included this impact in the calculation of the s-factor. The remainder of the circuit unavailability (for the unavailability parameters) or outage duration (for the average outage duration parameter) are proposed as exclusions under the force majeure criterion. This approach seems reasonable and in PB's view is consistent with the requirements of the definition of force majeure. Table 1 sets out the requirements of the force majeure criterion and summarises PB's views.

Table 1: Assessment of force majeure events due to industrial action

Element of criterion	PB assessment
Definition	Industrial and/or labour disputes are a valid force majeure event. The industrial action as described by Powerlink is consistent with this definition.
Was the event unforeseeable and its impact extraordinary, uncontrollable and not manageable?	The industrial action was enacted during negotiations for a new EBA agreement. As such, it is considered that it would have been unreasonable for Powerlink to assume that such actions would occur and that Powerlink should have included an allowance for such actions when proposing targets for service performance during its revenue submission.
Does the event occur frequently? If so how did the impact of the particular event differ?	Industrial action has occurred less often than yearly.
Could the TNSP, in practice, have prevented the impact (not necessarily the event itself)?	All excluded outages were initiated by external events on the network and hence were outside of Powerlink's control. The impact of each event being claimed as a force majeure event is only that portion identified by Powerlink as being directly related to the industrial actions and hence not preventable by Powerlink.
Could the TNSP have effectively reduced the impact of the event by adopting better practices?	PB examined each outage event and determined that Powerlink could not have influenced the impact of the events by adopting better work practices.

3.1.3 Force majeure events due to storms

Powerlink proposes to exclude the impact of a storm that occurred on 8 December 2008 from the calculation of the s-factor. The storm affected a transmission line located about 300 km north-west of Rockhampton, in central Queensland. High winds associated with the storm resulted in the failure of 7 transmission towers on the Dysart to Moranbah 132 kV line and the failure of several poles on an adjacent 66 kV pole line. In PB's view, the storm is consistent with the requirements of the definition of force majeure. Table 2 sets out the requirements of the force majeure criterion and summarises PB's views.

Table 2: Assessment of Force majeure events due to storms

Element of criterion	PB assessment
Definition	Storms are a valid force majeure event. Powerlink showed photographic evidence that the storm was the direct cause of the outage.
Was the event unforeseeable and its impact extraordinary, uncontrollable and not manageable?	The severe storm appears to have been a local occurrence as it was not reported by the Bureau of Metrology. The storm affected electricity assets owned by others (broken poles), indicating that poor design did not contribute to the impact of the event. In PB's view, the storm resulted in forces being applied to the transmission assets beyond the standard design parameters, resulting in failure of the assets.
Does the event occur frequently? If so how did the impact of the particular event differ?	Storms happen regularly in the Powerlink network area; however, transmission assets are designed to withstand most likely storm events. The impact of the storms of 8 December was so severe as to result in the failure of several transmission line towers and a nearby pole line owned by others.
Could the TNSP, in practice, have prevented the impact (not necessarily the event itself)?	The outage may have been prevented if assets in the area had been constructed to different (higher) design standards. However, there appears to be no specific reason that standards different to Powerlink's standard design practices (and the higher costs that these entail) should have been applied at the site where the failures occurred. PB concludes that it would be unreasonable to expect that Powerlink could have prevented the impact of the storm event.
Could the TNSP have effectively reduced the impact of the event by adopting better practices?	Powerlink may have been able to reduce the impact of the event by adopting different design practices that may have resulted in a lesser number of towers failing and hence a smaller number of assets requiring repair. However, there appears to be no specific reason that standards different to Powerlink's standard design practices (and the higher costs that these entail) should have been applied at the site where the failures occurred. Powerlink appears to have responded appropriately to the event. PB concludes that it would be unreasonable to expect that Powerlink could have reduced the impact of the storm event by adopting better practices.

3.2 Summary

Powerlink propose to exclude the impact of 23 events from the calculation of the s-factor under the force majeure and third party exclusion criteria.

PB considers that all of the exclusions proposed by Powerlink meet the criteria for exclusion.

4. Performance calculation

In this section, PB reviews the accuracy of Powerlink's calculation of service performance and the s-factor.

4.1 Accuracy of calculation

The calculation of the s-factor is completed in the excel spreadsheet provided by the AER. PB can confirm that Powerlink has used the spreadsheet provided by the AER. Table 3 shows the performance results for Powerlink and Table 4 shows the calculated s-factor for the 2008 period.

Table 3: Performance results for 2008

Performance parameter		Target	Performance		PB assessment
			Without exclusions	With exclusions	
Circuit availability					
S1	critical elements	99.07%	98.99%	98.99%	98.99%
S2	non–critical elements	98.40%	98.48%	98.51%	98.51%
S3	peak periods	98.16%	98.44%	98.48%	98.48%
Loss of supply					
S4	No of events > 0.2 system minutes	5	2	2	2
S5	No of events > 1.0 system minutes	1	0	0	0
Average outage duration					
S6	Average outage duration	1033	1075	1046	1046

Table 4: S-factor for 2008

Performance parameter		S-factor		PB assessment
		Without exclusions	With exclusions	
Circuit availability				
S1	critical elements	-0.0123%	-0.0117%	-0.0117%
S2	non–critical elements	0.0114%	0.0163%	0.0163%
S3	peak periods	0.0680%	0.0766%	0.0766%
Loss of supply				
S4	No of events > 0.2 system minutes	0.1550%	0.1550%	0.1550%
S5	No of events > 1.0 system minutes	0.3000%	0.3000%	0.3000%
Average outage duration				
S6	Average outage duration	-0.0106%	-0.0033%	-0.0033%

PB notes that the calculations in the AER spreadsheet are not protected in those sheets that perform the calculation of the s-factor. This represents a potential risk as a calculation may be accidentally altered and may not be readily discoverable. PB recommends that the calculations within the spreadsheet are protected to prevent accidental changes. PB checked the calculations and confirms that all calculations have been correctly performed.

Based on these results, PB confirms that the financial bonus for Powerlink under the AER Service Standards Scheme for 2008 is 0.5329% of the Annual Revenue for the period.

4.2 Summary

PB considers Powerlink's calculation of its s-factor to be free of errors, and confirms that the financial bonus for Powerlink under the AER Service Standards Scheme for 2008 is 0.5329% of the Annual Revenue for the period.

PB notes that the calculations in the AER spreadsheet are not protected in those sheets that perform the calculation of the s-factor. PB recommends that the calculations within the spreadsheet be protected to prevent accidental changes.

Appendix A

Definitions of the performance measures

Parameter 1 Transmission circuit availability	
Sub-parameter	transmission circuit availability (critical circuits) transmission circuit availability (non-critical circuits) transmission circuit availability (peak periods)
Unit of measure	percentage of total possible hours available.
Source of data	TNSP outage reports and system for circuit availability agreed schedule of critical circuits and plant peak period - 7:00 am to 10:00 pm weekdays, excluding public holidays off peak period all other times
Definition/formula	formula: $\frac{\text{No. hours per annum defined (critical / non – critical) circuits are available}}{\text{Total possible number of defined circuit hours}} \times 100$ definition: the actual circuit hours available for defined (critical/non critical) transmission circuits divided by the total possible defined circuit hours available a critical circuit element is an element of the 330 kV network, the 275 kV interconnected network that forms the backbone of the transmission system and interconnections to other jurisdictions. All other circuits are non-critical Powerlink should submit a list of critical circuits/system components annually as part of the AER's compliance review
Inclusions	'circuits' includes overhead lines, underground cables, power transformers, phase shifting transformers, static VAr compensators, capacitor banks, and any other primary transmission equipment essential for the successful operation of the transmission system outages from all causes including planned, forced and emergency events, including extreme events
Exclusions	unregulated transmission assets (e.g. some connection assets) any outages shown to be caused by a fault or other event on a '3rd party system' e.g. intertrip signal, generator outage, customer installation force majeure events any outage not affecting Powerlink's primary transmission equipment faults originating from Powerlink owned equipment that affect primary plant or equipment owned by a distributor, connected customer or a generator

Source: AER, 2007, *Decision, Powerlink Queensland Transmission Network Revenue Cap 2007–08 to 2011–12*

Parameter 2 Loss of supply event frequency	
Sub-parameters	number of events greater than 0.2 system minutes per annum number of events greater than 1.0 system minutes per annum
Unit of measure	number of significant events per annum
Source of data	TNSP outage reports and system for circuit availability
Definition/formula	number of events greater than 0.2 system minutes or 1.0 system minutes where: $\text{System minute} = \frac{\text{Customer outage duration (minutes)} * \text{load lost (MW)}}{\text{System maximum demand (MW)}}$ definition of system minute: The customer outage duration (in minutes) times the load lost (in megawatts) divided by the highest system maximum demand (in megawatts) that has occurred prior to the time of the event
Inclusions	all unplanned outages exceeding the specified impact (that is, 0.2 system minutes and 1.0 system minutes) all parts of the regulated transmission system extreme events
Exclusions	unregulated transmission assets (e.g. some connection assets) outages shown to be caused by a fault or other event on a 'third party system' e.g. intertrip signal, generator outage, customer installation planned outages force majeure events

Source: AER, 2007, *Decision, Powerlink Queensland Transmission Network Revenue Cap 2007–08 to 2011–12*

Parameter 3 Average outage duration	
Unit of measure	minutes
Source of data	TNSP outage reporting system
Definition/formula	formula: $\frac{\text{Aggregate minutes duration of all unplanned outages}}{\text{Number of events}}$ definition: the cumulative summation of the outage duration time for the period, divided by the number of outage events during the period the start of each outage event is the time of the interruption of the first circuit element. The end of each outage event is the time that the last circuit element was restored to service the impact of each event is capped at seven days
Inclusions	faults on all parts of the transmission system (connection assets, interconnected system assets) all forced and fault outages whether or not loss of supply occurs
Exclusions	planned outages momentary interruptions (duration of less than one minute) force majeure events

Source: AER, 2007, *Decision, Powerlink Queensland Transmission Network Revenue Cap 2007–08 to 2011–12*