

# Audit of ElectraNet service standards performance reporting 2008

March, 2009

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Australian Energy Regulator

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## Executive summary

Parsons Brinckerhoff (PB) has been engaged by the Australian Energy Regulator (AER) to undertake an audit of ElectraNet's compliance with the 2002 revenue cap decision<sup>1</sup> and the 2008 revenue cap decision<sup>2</sup>.

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 ElectraNet system for the recording, processing and reporting of service standards under the service standards regime to be a robust and reliable system, free from material errors.

### Exclusions

ElectraNet proposes to exclude the impact of 43 events from the calculation of the s-factor, including 6 under the third party exclusion criteria. The remainder of the proposed exclusions are for decommissioned assets or the opening of one end of a transmission line that remained available to carry power or for transient outages. Outages where the 14-day cap was reached are also listed.

There are three events that are requested to be excluded from the first period of the service performance incentive scheme are in PB's view not valid exclusions. This relates to two events that were identified as road widening requests and a third event was for tall trucks travelling under power lines. PB recalculated the change and found that there was a difference in the scheme values.

There are two transient events (of less than 1 minute duration) that are proposed to be excluded from the Total Circuit Availability parameter. While the allowable exclusions for this parameter do not include transient outages, the impact of excluding transient outage events is immaterial. All other events meet the exclusion criteria.

There is one single event requested to be excluded from the second period of the service incentive scheme is however, PB's view is that although the circuit was energised from one end, it was not possible for ElectraNet to use the circuit and therefore it does not meet the terms of being available and should not be excluded. PB calculated the impact of this change and found no material difference to the incentive scheme values.

ElectraNet has used a pro-rata approach towards events that span the two regulatory periods. The basis for the pro-rata allocation is the proportion of total outage hours incurred in each regulatory period. In PB's view, this is a reasonable approach.

### Performance calculations

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<sup>1</sup> South Australian Transmission Network Revenue Cap 2003-2007/08, December 2002

<sup>2</sup> Final decision; ElectraNet transmission determination 2008-09 to 2012-13, April 2008

ElectraNet provided two spreadsheets for the 2008 calendar year. The first spreadsheet covers the period from 01 January 2008 to 30 June 2008 and is based on the service standards outlined in the 2002 revenue cap decision. PB has reviewed the spreadsheet and has found that the calculation has been correctly applied.

The second spreadsheet provided by ElectraNet covers the period from 1 July 2008 until 31 December 2008 and is based on the new service standards regime as defined in the AER's 2007 revenue cap decision. PB also reviewed this spreadsheet and found that the correct calculation has been applied.

PB notes that the calculations in the AER spreadsheet are not protected in those sheets that perform the calculation of the s-factor. PB sees this as 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.

# 1. Introduction

Parsons Brinckerhoff (PB) has been engaged by the Australian Energy Regulator (AER) to undertake an audit of ElectraNet's compliance with the 2002 revenue cap decision<sup>3</sup> and the 2008 revenue cap decision<sup>4</sup>. ElectraNet is the operator and manager of the electricity transmission network in South Australia.

The audit covers service performance for the period 1 January 2008 to 31 December 2008 where the performance for the first half of the year was under the service standards incentive scheme set out in the ACCC's 2002 decision and the service standards performance incentive scheme as set out in the AER's 2008 decision.

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

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

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<sup>3</sup> South Australian Transmission Network Revenue Cap 2003-2007/08, December 2002

<sup>4</sup> Final decision; ElectraNet transmission determination 2008-09 to 2012-13, April 2008

## 2. Review of recording and reporting systems

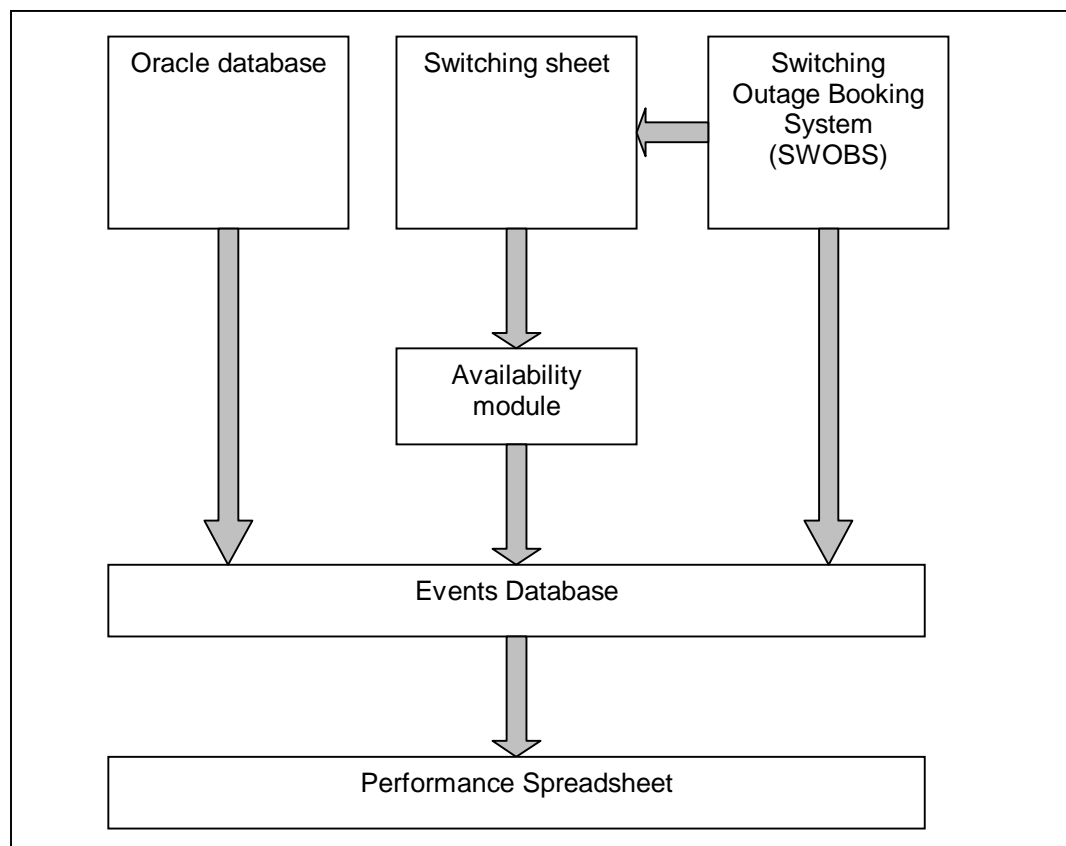
This section of the report sets out the results of the audit of ElectraNet’s system for recording and reporting of network events that are used in the calculation of the service standards factor (s-factor). An overview of the recording and reporting system is provided, followed by a report on the three 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 ElectraNet data reporting system is illustrated in Figure 1.

**Figure 1: Representation of ElectraNet’s reporting system**



Source: ElectraNet

ElectraNet stated that it has not modified its performance data capture and processing system from that used in previous years. As the performance data capture and processing system has been fully described in previous audit reports, only a brief description is provided here.

The focal point of the performance recording system is a program referred to by ElectraNet as the ‘Events Database’. The Events Database is a single point database that captures



data that is used for reporting more than service performance information. For example, data for fault investigations is stored in the Events Database.

When considering the service performance measures, data is captured in the Events Database through four sources:

**Switching Outage Booking System (SWOBS)** – The SWOBS is an outage planning and scheduling tool with additional features that allow authorised personnel, both internal to ElectraNet and relevant external parties, to enter the requirements of an outage – effectively an outage request. Details of the outage request include:

- proposed time and date
- specific plant outages.

ElectraNet plan and schedule the outages with completion of the outage request process being approval or rejection of the outage request. External parties are able to view both approved and rejected outage requests.

On approval of the outage request, ElectraNet develops an initial switching sheet, which will subsequently be checked and amended as required. Historical switching sheets are available at this point to use as templates. An auditable trail of approvals is maintained in the SWOBS system.

ElectraNet are planning to integrate the current SWOBS system to include a business to business (B2B) interface with the NEMMCO outage scheduler to improve the efficiency of the process.

The SWOBS database is the initial source of the equipment that is taken out of service and includes planned outage times and dates.

**Switching sheet** – Once an outage request has been received, the switching sheet passes into the Control Room. Operators in the Control Room record the switching of plant in two places, on a printed switching sheet and in an electronic operator's log.

The events database is a Delphi / Oracle application used by the Operators to enter the events that occur on the system. Data captured includes:

- item of equipment
- time equipment operated
- time the equipment operated
- other factors at the time (protection operation, planned, etc).

For the purposes of producing the performance service scheme figures, the data is extracted from the electronic log and entered into the availability module.

Forced or unplanned outages are entered directly into the electronic log and this is the initial source for event investigations.

**Availability Module** – This module is the main interface module for the Events Database for recording availability of plant. All events that occur on the ElectraNet system are created in the Availability Module. For planned outages, data is transferred to this module from the operator logs. ElectraNet staff access these modules and manually change the planned

'start times' that are extracted from the SWOBS database and update them with the actual switching times as presented in the operator logs from the Control Room.

**Oracle Database** – ElectraNet store information on each equipment element on their system in an Oracle database. The Events Database interfaces with this database and extracts information. For performance, information includes:

- categorisation of a circuit as critical or non-critical
- identification as a connection asset or regulated asset
- equipment element type (transformer, circuit breaker, line etc).

The database provides a single source for all asset management data.

**Performance Spreadsheet** – The final stage in processing the performance data to produce the figures for the service standards regime is an excel spreadsheet. The data for the Performance Spreadsheet uses reports that are extractions from the Events Database via queries.

The reports are compiled using simple queries that limits the information to a specific area of the service standards, for example the Line Availability parameter is a single report that includes all lines that are to be included in that particular measure.

## 2.2 Inputs to the system

PB established that between 1 January 2008 and 31 December 2008, 878 circuit elements were affected by planned or forced outages.

PB notes that audits in previous years of the ElectraNet reporting system have shown no material errors and therefore only limited data sampling was performed to confirm the accuracy of the data inputs to the recording and reporting system.

The checks included examining five individual events selected at random from the Line Availability Module to establish the accuracy of data as it is translated from real event time to the performance service scheme calculation. The sources of data are listed below along with the points where it is transferred to documents and whether the process is automatic or manual or is not used.

**Table 1: Data flow from original sources to performance schemes**

Data source	Transfer path	Transfer process
SCADA	SCADA to Events Database	Manual
Switching Sheet	Events Database to Availability Module	Manual
SWOBS	SWOBS to Events Database	Automatic
Events Database	Events Database to Performance spreadsheet	Automatic
Performance spreadsheet	-	-

As ElectraNet has two areas that rely on manual processing, PB examined these areas in detail. PB requested and was supplied with data on five randomly selected events to establish if the data in each stage of entry was correct, namely the inputting of data into the

electronic log and the Availability Module. As SCADA data is automatically logged, PB took these times and dates to be correct and used them as the baseline for the manual inputs.

After examining the switching sheets and the Availability Module PB found one error in the time entry – a time difference of one minute. In PB's view this is a minor error and given the typical duration of outage events is around 200 minutes, will not materially affect the calculation of the s-factor.

PB notes that ElectraNet establishes the circuit off time as the time when the circuit breaker that de-energises the piece of equipment is opened. This is the start of the unavailability period under the service standards incentive scheme and service standards performance incentive scheme. When returning the equipment item to service, the time of the first circuit breaker closing to energise the equipment is deemed as the time that the equipment is available. Additionally a line that is energised from one end remains available to carry power does not count towards circuit unavailability performance. PB understands that these interpretations were used when determining performance targets under the service standards incentive scheme and service standards performance incentive scheme and hence are appropriate.

## 2.3 Processing system

PB observed the operation of ElectraNet's Performance spreadsheet during the site visit and was satisfied that the system appeared to function as designed. PB was provided with a copy of the spreadsheet and we were able to check the arithmetic functions that processed the data. They were found to have been correctly constructed and applied. The fourteen day cap on transmission line availability is also applied within the spreadsheet. PB confirms that the cap was correctly applied.

The spreadsheet is built around sampling single reports. Each performance indicator is sourced from a separate report, where the report is extracted from the Event Database as discussed above. The principle is that the coding is built to extract data for that particular indicator rather than a single report that is manipulated to produce the required performance indicators. Although this approach generates more spreadsheets, the Excel calculations are simplified. PB reviewed all the line queries for November 2008 (67 lines) against the list of included lines (34 lines) to look for errors or omissions. PB found no errors in the data or in the spreadsheet formulas.

PB also checked the spreadsheet formulae used to calculate the s-factor and confirmed that they correctly meet the definitions for each parameter as set out in the service standards incentive scheme and service standards performance incentive scheme.

## 2.4 Reporting system

PB confirmed that the s-factors calculated in ElectraNet's AER Service Standards report are the same as reported in the AER's reporting template.

## 2.5 Summary

PB found the ElectraNet system for the recording, processing and reporting of service standards under the service standards incentive scheme and service standards performance incentive scheme 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 ElectraNet to accurately identify and record exclusions to the service standards incentive scheme and service standards performance incentive scheme.

### 3.1 Accuracy

ElectraNet propose to exclude the impact of 43 events from the calculation of the s-factor. The events are proposed to be excluded on the basis of third party, switching to control voltages, and decommissioned lines. Outages where the 14-day cap was reached are also listed. PB examined each event to determine whether the event met the requirements of the exclusion criterion.

PB found:

- outages caused by third parties were inappropriately classified
- switching for control voltages were correctly excluded
- decommissioned lines were appropriately classified and excluded under the “unregulated” category
- transient events were incorrectly excluded from the availability parameter
- events that were capped at 14-days were listed.

Each of these proposed exclusions is discussed below.

#### 3.1.1 Customer requested outages

ElectraNet has requested that three events be excluded from the service standards scheme under the 3<sup>rd</sup> party exclusion criterion. The justification for excluding two of the three events is that they are customer requested alterations due to road widening activities. The third event is related to clearance for excessively tall trucks passing under transmission lines.

PB examined the scope of these exclusions against the service standards incentive scheme set out in the ACCC’s 2002 decision. In PB’s evaluation road widening activities and clearance requests do not meet the parameters of the exclusion criterion.

The service standards incentive scheme allows for 3<sup>rd</sup> party events to be excluded where any outage is shown to be caused by a fault or other event on a 3<sup>rd</sup> party system. The examples given are intertrip signals, generator outages or a customer installation. In PB’s view, these three events were not caused by a fault nor an event on a 3<sup>rd</sup> party system.

PB recommends that these three events are not excluded from the service performance scheme. We also note that there is a material affect on the performance incentive scheme results.

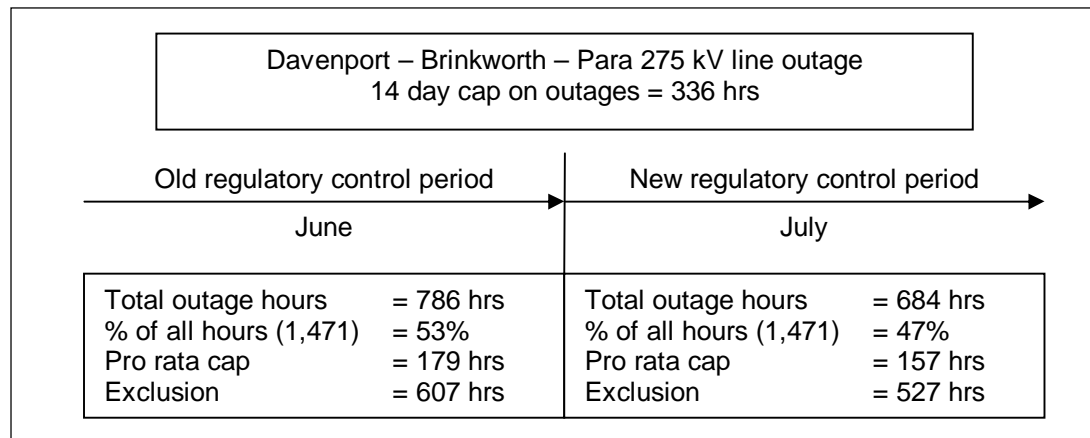
### 3.1.2 Successful reclose events

ElectraNet proposes to exclude two transient events (of less than 1 minute duration) from the Total Circuit Availability parameter. While the allowable exclusions for this parameter do not include successful reclose events, the impact of excluding these from Circuit Availability parameters is immaterial. This is because the duration of a successful reclose event is very much less than the average duration of a sustained outage.

### 3.1.3 Capped events

ElectraNet has listed those events that in the calculation of the transmission line availability parameter were capped at 14-days. A pro-rata method was applied to events that span the two reporting periods, i.e. the 14-day cap on the transmission line availability is proportioned across each reporting period. The basis for the pro-rata allocation is the proportion of total outage hours. For example, the Davenport-Brinkworth-Para 275 kV line outage has the cap proportioned as set out in Figure 2.

**Figure 2: Representation of the pro-rata of the exclusion cap on events**



The 2002 and 2008 revenue cap decisions or the service standards incentive scheme and service standards performance incentive scheme do not clearly state how caps should be treated when an event spans two reporting periods. PB has examined ElectraNet's approach to pro-rata the cap and this appears to be a fair and reasonable approach. PB recommends that ElectraNet's approach is approved as an appropriate methodology.

### 3.1.4 Transition in the performance scheme

With the change in the service performance scheme from 1 July 2008, there has been a change in the definitions of some of the performance parameters. Table 2 lists the performance parameter used in the first part of the reporting period and compares these to the performance parameters used in the second part of the reporting period.

**Table 2: Comparison of performance scheme measures for ElectraNet**

2003 Scheme		2008 Scheme	
Parameter	Definition / unit	Parameter	Definition / unit
<b>Transmission circuit availability</b>			
		Total circuit	Peak 08:00 to 20:00 weekdays
		peak critical	
		non-peak critical	
<b>Loss of supply event frequency</b>			
greater than 0.2 system minutes pa	System minutes	greater than 0.05 system minutes pa	System minutes
greater than 1.0 system minutes pa		greater than 0.2 system minutes pa	
<b>Average outage duration</b>			
Lines	Minutes	-	Minutes
Transformers / plant		-	
-		connection points	
<b>Transmission constraints</b>			
Intra-regional	Hours pa	-	
<b>Transmission constraints</b>			
Inter-regional	Hours pa	-	

Source: ElectraNet 2002 revenue cap decision; Proposed performance scheme parameters, January 2007

Most of the changes occur in the transmission circuit availability measure. The 2008 scheme re-defines peak period times and dates and reduces the number of sub-parameters from seven to three, although the non-peak critical sub-parameter is allocated a weighting of zero and hence does not result in a reward or penalty.

There is little change in the loss of supply frequency measure and average outage duration measures except to update the applicable event threshold. The transmission constraints measure has been removed from the incentive scheme from 1 July 2008.

ElectraNet has produced two separate performance spreadsheets to contend with the change in the scheme. This approach is further supported with two separate databases of circuit events that correspond to the two reporting periods.

PB discussed the transition with ElectraNet and the effect that this has had on the coding within the spreadsheet. ElectraNet confirmed that the changes required to align with the new parameters was minimal, i.e. changing the times for transmission lie availability measure did not require any alterations. ElectraNet also confirmed that the classification of critical and non-critical circuits was already functional and, again, did not require any alterations to the spreadsheet calculations.

PB did not find any errors or omissions in the database. PB reviewed the declared holidays and time bounds and found that they agree with the definitions set out in the service standards incentive scheme and service standards performance incentive scheme.

## 3.2 Detailed review of specific exclusions

PB examined specific exclusions in detail to understand the basis of the exclusions and how they have been classified. This section discusses these exclusions, as listed below.

### 3.2.1 Momentary interruptions (<1 minute duration)

ElectraNet has requested two events in the first half of the period be excluded from the circuit availability measure. The two events are listed as events that caused an interruption of less than one minute.

Under the service standards incentive scheme, a momentary interruption is not in the list of valid exclusions and PB could not see any reason for excluding these two events. However, PB notes that the duration of these events is less than one minute each and has no material effect on circuit availability.

PB recommends that these two events are not excluded from the service performance scheme, but we note that there is no material affect on the performance incentive scheme results.

### 3.2.2 Mount Barker to Mobilong / Para to Angas line outages

ElectraNet may be required to switch circuits in and out of service at certain times of the day to assist in the control of transmission voltages. Instructions are received from NEMMCO or where NEMMCO does not have direct oversight of the network, by the ElectraNet Control Room.

PB examined one sequence of events that accounted for 9 of the 10 submitted exclusions (Mount Barker – Mobilong 132 kV forced line outage). PB examined seven sources of information to establish the accuracy of the exclusions. The sources were:-

- SCADA
- availability Modules
- network single line diagrams
- event / incident reports
- switching sheets
- SWOBS switching sheets
- discussions with ElectraNet staff.

PB established that at the time the outages occurred, the Mount Barker – Mobilong 132 kV line was being operated open ended, that is, the circuit breaker at one end of the line was open, leaving the line energised but not supplying energy. This was due to the nature of another fault on the system. The opening of one end of a transmission line where the transmission line remains energised and available to carry power is an allowable exclusion. PB notes, however, that ElectraNet should have listed these events as proposed exclusions.

PB was informed by ElectraNet that it was required to de-energise the line at certain times in order to ensure that the required voltage levels were maintained on the network. As the line was available to be energised, PB confirms that these events meet the relevant criteria for exclusion.

### 3.2.3 Monash to Berri 132 kV flashover

ElectraNet has applied for the Monash to Berri 132 kV line trip event to be excluded from the total circuit availability measure. The cause of the event is listed as an insulator flashover.

ElectraNet clarified that the insulator flashover caused both Monash to Berri 1 & 2 circuits to trip coincidentally. While a set of circuit breakers at one end of the line reclosed successfully, the set at the other end of the line remained open. This led to the single circuit being charged from one end and open at the other end.

In PB's evaluation, the circuit was not able to carry power as a circuit breaker had operated and opened automatically. The exclusion criterion is only met if the circuit is available to carry power. In PB's view Once a fault has occurred and a circuit breaker has stayed open, the circuit is not available to carry power until the fault or cause has been resolved.

Therefore, in PB's view this event is not a valid exclusion and its impact should be included in the total circuit availability measure. PB analysed the change in the circuit availability and found that this single event did not materially affect the performance incentive scheme results.

## 3.3 Summary

ElectraNet proposes to exclude the impact of 43 outages from the calculation of the s-factor, including 6 outages arising from 3 events under the third party exclusion criteria. The remainder of the proposed exclusions were for de-commissioned assets or the opening of one end of a transmission line that remained available to carry power, or for transient outages. Outages where the 14-day cap was reached were also listed.

Two transient events (of less than 1 minute duration) were excluded from the Total Circuit Availability parameter. While the allowable exclusions for this parameter do not include transient outages, the impact of excluding transient outage events is immaterial. All other events meet the exclusion criteria.

Three events were requested to be excluded from the first period of the service performance incentive scheme and in PB's view were not valid exclusions. This relates to two events that were identified as road widening requests and a third event was for tall trucks travelling under power lines. PB calculated the change and found that there was a difference in the scheme values.

One event was requested to be excluded from the second period of the service incentive scheme, however, PB's view is that although the circuit was energised from one end, it was not possible for ElectraNet to use the circuit and therefore it does not meet the terms of being available and should not be excluded. PB recalculated the change and found no material difference to the incentive scheme values.

For the Transmission Line Availability parameter, ElectraNet has used a pro-rata approach towards events that span the two regulatory periods. The basis for the pro-rata allocation is the portion of the total outage hours that occurred within each period. In PB's view, this is a reasonable approach.



## 4. Performance calculation

In this section, PB reviews the accuracy of ElectraNet'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 ElectraNet has used the spreadsheet provided by the AER. Table 3 and Table 4 shown the performance results for ElectraNet in each period followed by Table 5 and Table 6 that show the calculated s-factor for each period.

**Table 3: Performance results for first period**

Performance parameter		Target	Performance		PB assessment
			Without exclusions	With exclusions	
S1	Total circuit availability (%)	99.25	99.10	99.39	99.35
<b>Loss of supply event frequency<sup>5</sup></b>					
S2	>0.2 system minutes	3.00	0.00	0.00	0.00
S3	>1.0 system minutes	1.00	0.00	0.00	0.00
S4	Average outage duration (minutes)	100	203	203	203

**Table 4: Performance results for second period**

Performance parameter		Target	Performance		PB assessment
			Without exclusions	With exclusions	
<b>Circuit availability</b>					
S1	Total (%)	99.47	98.98	99.05	99.05
S2	Peak critical (%)	99.24	97.19	97.26	97.26
<b>Loss of supply event frequency<sup>5</sup></b>					
S3	>0.05 system minutes	4	3	3	3
S4	>0.2 system minutes	2	1	1	1
S5	Average outage duration (minutes)	78	195	195	195

<sup>5</sup> Loss of supply targets in tables 3 and 4 were scaled to reflect that the performance would be measured for only half of the year

**Table 5: Calculated S-factor for first period**

Performance parameter		s-factor		PB assessment
		Without exclusions	With exclusions	
S1	Total circuit availability (%)	-0.0700	0.1400	0.1000
<b>Loss of supply event frequency</b>				
S2	>0.2 system minutes	0.1000	0.1000	0.1000
S3	>1.0 system minutes	0.3000	0.3000	0.3000
S4	Average outage duration (minutes)	-0.2500	-0.2500	-0.2500

**Table 6: Calculated s-factor for second period**

Performance parameter		s-factor		PB assessment
		Without exclusions	With exclusions	
<b>Circuit availability</b>				
S1	Total (%)	-0.3000	-0.3000	-0.3000
S2	Peak critical (%)	-0.2000	-0.2000	-0.3000
<b>Loss of supply event frequency</b>				
S3	>0.05 system minutes	0.1000	0.1000	0.1000
S4	>0.2 system minutes	0.2000	0.2000	0.2000
S5	Average outage duration (minutes)	-0.2000	-0.2000	-0.2000

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.

## 4.2 Annual revenue calculation

The financial incentive for the year should be calculated as shown in Equation 1 below.

**Equation 1: Financial incentive calculation for ElectraNet**

$$Financial\_incentive_{2008} = \left( \frac{AR_{2007-2008}}{2} \times S_{1Jan2008-30Jun2008} \right) + \left( \frac{AR_{2008-2009}}{2} \times S_{1Jul2008-31Dec008} \right)$$

ElectraNet has produced two s-factors and two financial incentives, listed in Table 7 below.

**Table 7: Financial incentive and s-factors for the 2008 period**

Period	Total s-factor	Financial incentive
First period	0.25%	\$232,225
Second period	-0.40%	-\$459,980
Total		-\$227,755

PB reviewed the allocation of the allowable revenue and found that it has been correctly applied. PB confirms that the s-factors and the total financial incentives appear to have been correctly applied and calculated.

### 4.3 Summary

ElectraNet has provided two spreadsheets for the 2008 calendar year. The first spreadsheet covers the period from 01 January 2008 to 30 June 2008 and is based on the service standards incentive scheme outlined in the ACCC's 2002 revenue cap decision. PB has reviewed the spreadsheet and has found that calculation has been correctly applied.

The second spreadsheet provided by ElectraNet covers the period from 01 July 2008 until 31 December 2008 and is based on the service standards performance incentive scheme as defined in the AER's 2008 revenue cap decision. PB also reviewed this spreadsheet and found that the correct calculation has been applied.

PB notes that the calculations in the AER spreadsheet are not protected in those sheets that perform the calculation of the s-factor. PB sees this as 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.

## **Appendix A**

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Definitions of the performance measures

Extract from the  
South Australian Transmission  
Network Revenue Cap 2003-2007/08

Dated 11 December 2002

File No: C2001/1094

## Appendix 5 - Performance indicator definitions

### Measure 1 Transmission circuit availability

Sub-measures	<p>Transmission circuit availability (critical circuits)</p> <p>Transmission circuit availability (non-critical circuits)</p> <p>Transmission circuit availability (peak periods)</p> <p>Transmission circuit availability (intermediate periods)</p> <p>Transmission lines</p> <p>Transmission transformers</p> <p>Transmission reactive</p>
Unit of Measure	Percentage of total possible hours available.
Source of Data	<p>TNSP outage reports and system for circuit availability</p> <p>Agreed Schedule of Critical Circuits and plant</p> <p>Nominated peak/off-peak hours</p> <p>Currently peak-7:00 am to 10:00 pm weekdays</p> <p>Or as otherwise defined by the TNSP/NEMMCO</p> <p>Off peak-all other times</p> <p>May include intermediate time periods and seasonal periods</p>
Definition/Formula	<p>Formula:</p> $\frac{\text{No. hours per annum defined (critical/non-critical) circuits are available} \times 100}{\text{Total possible no. of defined circuit hours}}$ <p>Definition: The actual circuit hours available for defined (critical/non-critical) transmission circuits divided by the total possible defined circuit hours available.</p> <p>Note that there shall be an annual review of the nominated list of critical circuits/system components</p>
Exclusions	<p>Exclude unregulated transmission assets (e.g. same connection assets).</p> <p>Exclude from 'circuit unavailability' any outages shown to be caused by a fault or other event on a '3<sup>rd</sup> party system' e.g. intertrip signal, generator outage, customer installation (TNSP to provide list)</p> <p>Force majeure events</p>
Inclusions	<p>'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 (TNSP to provide lists)</p> <p>Circuit 'unavailability' to include outages from all causes including planned, forced and emergency events, including extreme events</p>

## Measure 2 Loss of supply event frequency index

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 per annum Number of events greater than 1.0 system minutes per annum Such that: <ul style="list-style-type: none"><li>▪ a 0.2 system minute event has a return period of one year</li><li>▪ a 1.0 system minute event has a return period of two years</li></ul>
Exclusions	Exclude unregulated transmission assets (e.g. some connection assets) Exclude any 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
Inclusions	All unplanned outages exceeding the specified impact (i.e. 0.2 minutes and 1.0 minutes) Includes outages on all parts of the regulated transmission system Includes extreme events

### Measure 3 Average outage duration

Sub-measures	Transmission lines Transmission transformers/plant
Unit of Measure	Minutes
Source of Data	TNSP Outage Reporting System
Definition/Formula	Formula: <b><u>Aggregate minutes duration of all unplanned outages</u></b> <b>No. of events</b> Definition: The cumulative summation of the outage duration time for the period, divided by the number of outage events during the period
Exclusions	Planned outages Excludes momentary interruptions (< one minute) Force majeure events
Inclusions	Includes faults on all parts of the transmission system (connection assets, interconnected system assets) Includes all forced and fault outages whether or not loss of supply occurs



#### **Measure 4 Transmission constraints (Intra-regional)**

Unit of Measure	Hours per annum
Source of Data	NEMMCO and TNSP
Definition/Formula	Formula: Aggregate number of hours per annum that binding constraints exist on any part of the interconnected transmission system within a region (excludes interconnectors)
Exclusions	Hours of binding constraints at or near (>95 per cent) the capacity determined by the constraint equation describing all transmission elements in service Excludes connection assets Hours of binding constraints where non-credible generation contingencies coincide with previously notified planned outages Force majeure events
Inclusions	Includes binding constraints requiring 'out-of-merit-order' scheduling of generation or rotational load shedding Includes binding constraints from all causes including planned, forced and emergency events, including extreme events

## Measure 5 Transmission constraints (Inter-regional)

Unit of Measure	Hours per annum
Source of Data	NEMMCO and TNSP
Definition/Formula	Formula: Aggregate number of hours per annum that binding constraints exist on an inter-regional interconnector. Hours of binding constraints to be accumulated against 'importing' TNSP.
Exclusions	Hours of binding constraints at or near (>95 per cent) the capacity determined by the constraint equation describing all transmission elements in service Hours of binding constraints where non-credible generation contingencies coincide with previously notified planned outages Any event which was clearly as a consequence of action or inaction of another TNSP Force majeure events
Inclusions	Events where binding constraints occur due to unavailability of interconnector support assets Includes binding constraints from all causes including planned, forced and emergency events, including extreme events

## **Definition of force majeure**

For the purpose of applying the Service Standards Performance Incentive Scheme to ElectraNet, 'Force majeure events' means any event, act or circumstance or combination of events, acts and circumstances which (despite the observance of good electricity industry practice) is beyond the reasonable control of the party affected by any such event, which may include, without limitation, the following:

- fire, lightning, explosion, flood, earthquake, storm, cyclone, action of the elements, riots, civil commotion, malicious damage, natural disaster, sabotage, act of a public enemy, act of God, war (declared or undeclared), blockage, revolution, radioactive contamination, toxic or dangerous chemical contamination or force of nature
- action or inaction by a court, government agency (including denial, refusal or failure to grant any authorisation, despite timely best endeavour to obtain same)
- strikes, lockouts, industrial and/or labour disputes and/or difficulties, work bans, blockades or picketing
- acts or omissions (other than a failure to pay money) of a party other than the TNSP which party either is connected to or uses the high voltage grid or is directly connected to or uses a system for the supply of electricity which in turn is connected to the high voltage grid
- where those acts or omissions affect the ability of the TNSP to perform its obligations under the service standard by virtue of that direct or indirect connection to or use of the high voltage grid.

Force majeure, in this occurrence, excludes third party and natural events for which the TNSP can not reasonably be expected to cater for.

Extract from the  
ElectraNet Transmission  
Determination 2008-09 to 2012-13

Dated 11 April 2008

## Appendix C: Parameter definitions

The following parameter definitions apply to ElectraNet during its next regulatory control period.

<b>Parameter 1</b>	<b>Transmission circuit availability</b>
Sub-parameters	transmission circuit availability  critical circuit availability peak  critical circuit availability non peak
Unit of measure	Percentage of total possible hours available
Source of data	The following circuits are defined as critical:

<b>Line no.<sup>a</sup></b>	<b>Voltage (kV)</b>	<b>Circuit name</b>	<b>Length (km)</b>
1904	275	Para – Tailem Bend no.2	105.4
1910	275	Davenport – Brinkworth (east circuit)	147.4
1911	275	Brinkworth – Para (east circuit)	133.8
1918	275	Davenport – Para (west circuit)	265.5
1919	275	Davenport – Canowie Canowie – Robertstown	212.5
1920	275	Davenport – Robertstown no. 2	212.5
1921	275	Para – Tailem Bend no.1	101.6
1922	275	Tailem Bend – South East no. 1	308.2
1923	275	Tailem Bend – South East no. 2	308.2
1930	275	South East – Heywood no. 1	12.0
1931	275	South East – Heywood no. 2	12.0
1938	275	Robertstown – Cherry Gardens no. 1	163.7
1939	275	Robertstown – Cherry Gardens no. 1	163.7

(a) Some of these lines will be split because of capital works. The number of circuits (and the denominator in the availability calculation) will change as these splits occur.

Peak periods are 8.00 am to 8.00 pm weekdays and non-peak periods are all other times.

Definition/formula	<p>formula:</p> $\frac{1 - \Sigma (\text{number of interrupted circuit hours})}{\text{total possible circuit hours available}}$
	<p>where:</p> <p>number of interrupted circuit hours means in relation to each circuit, the number of hours during each reporting period in which that circuit was unavailable to provide transmission services</p> <p>total possible circuit hours available is the number of circuits multiplied by 8760 hours</p>
Inclusions	<p>circuits include regulated overhead lines and underground cables (each with a designated ElectraNet transmission segment identification number). Transformers, reactive plant and other primary plant are excluded from the performance parameter</p> <p>subject to the exclusions specified below, outages on all parts of the regulated transmission system from all causes including planned, forced and fault events</p>
Exclusions	<p>unregulated transmission assets</p> <p>any outages shown to be caused by a ‘third party system’—eg. intertrip signals, generator outage, customer installation, customer request or NEMMCO direction</p> <p>outages to control voltages within required limits, both as directed by NEMMCO and where NEMMCO does not have direct oversight of the network (in both cases only where the element is available for immediate energisation if required)</p> <p>the opening of only one end of a transmission line where the transmission line remains energised and available to carry power</p> <p>the number of interrupted hours related to a single transmission line redevelopment project or substation redevelopment project is capped at 336 hours (14 days)</p> <p>force majeure events</p>

<b>Parameter 2</b>	<b>Loss of supply event frequency</b>
Sub-parameter	<p>frequency of events where loss of supply exceeds 0.05 system minutes</p> <p>frequency of events where loss of supply exceeds 0.2 system minutes</p>
Unit of measure	number of events per annum
Definition/formula	<p>number of events greater than 0.05 system minutes per annum</p> <p>number of events greater than 0.2 system minutes per annum</p> <p>system minutes are calculated for each supply interruption by the ‘load integration method’ using the following formula:</p> $\frac{\Sigma (\text{MWh unsupplied} \times 60)}{\text{MW peak demand}}$ <p>where:</p> <p>MWh unsupplied is the energy not supplied as determined by using NEM metering and substation load data. This data is used to estimate the profile of the load over the period of the interruption by reference to historical load data</p> <p>period of the interruption starts when a loss of supply occurs and ends when ElectraNet offers supply restoration to the customer</p> <p>MW peak demand means the maximum amount of aggregated electricity demand recorded at entry points to the ElectraNet transmission network and interconnector connection points during the financial year in which the event occurs or at any time previously</p> <p>the performance parameter applies to exit points only</p> <p>an interruption 0.2 system minutes also registers as a &gt;0.05 system minutes event</p> <p>interruptions affecting multiple connection points at exactly the same time are aggregated (i.e. system minutes are calculated by events rather than connection point interruptions)</p>
Inclusions	subject to the exclusions specified below, all unplanned customer outages on all parts of the regulated transmission system

forced outages where notification to affected customers is less than 24 hours (except where NEMMCO reschedules the outage after notification has been provided)

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Exclusions

successful reclose events (less than one minute duration).

unregulated transmission assets

any outages shown to be caused by a 'third party system'—e.g. intertrip signals, generator outage, customer installation, customer request or NEMMCO direction

planned outages

for supply outages resulting from an interconnector outage, the period of the interruption is capped at half an hour. This is done to include the impact of automatic under-frequency load shedding, but to exclude the impact of any market failure to respond and restore load within required timeframes (i.e. excluding factors outside of ElectraNet's control)

pumping station supply interruptions (these interruptions were excluded from historical data used for target setting due to the highly irregular nature of these loads, which makes accurate estimation of load profiles unreliable)

force majeure events

where ElectraNet protection operates incorrectly ahead of third party protection, the portion of customer load that would have been lost had ElectraNet protection not operated is removed from the total lost load

where ElectraNet protection operates correctly due to a fault on a third party system no lost load is recorded

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### Parameter 3 Average outage duration

Unit of measure	minutes
Definition/formula	$\frac{\text{Aggregate minutes duration of all unplanned outages}}{\text{Number of connection point events}}$ <p>the cumulative summation of the outage duration time for the period, divided by the number of connection point outage events during the period</p> <p>where: outage duration time for a connection point starts when a loss of supply occurs and ends when ElectraNet offers supply restoration to the customer</p> <p>the performance parameter applies to exit points only</p> <p>outage duration extends to the point at which supply restoration is offered to the customer</p>
Inclusions	<p>subject to the exclusions specified below, customers supply outages on all parts of the regulated transmission system</p> <p>forced outages where notification to affected customers is less than 24 hours (except where NEMMCO reschedules the outage after notification has been provided)</p>
Exclusions	<p>successful reclose events (less than one minute duration)</p> <p>unregulated transmission assets</p> <p>any outages shown to be caused by a ‘third party system’—eg intertrip signals, generator outage, customer installation, customer request or NEMMCO direction</p> <p>planned outages</p> <p>for supply outages resulting from an interconnector outage, the duration is capped at half an hour. This is done to include the impact of automatic under-frequency load shedding, but to exclude the impact of any market failure to respond and restore load within required timeframes (i.e. excluding factors outside of ElectraNet’s control)</p> <p>force majeure events</p> <p>where ElectraNet protection operates correctly due to a fault on a third party system no outage duration is recorded</p>