Australian Competition and Consumer Commission (ACCC)

Audit of ElectraNet SA Service Standards Performance Reporting

Australian Competition
and Consumer Commission

Audit of ElectraNet SA Service Standards Performance Reporting

- Final Report
- 11/06/2004

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Contents

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1. Executive Summary

Sinclair Knight Merz (SKM) was engaged by the Australian Competition and Consumer Commission (ACCC) to conduct an audit of the first year performance report of ElectraNet SA under the ACCC Performance Incentive (PI) Scheme.

The audit reviewed the performance results submitted by ElectraNet SA, in particular:

- the adequacy and accuracy of the recording system used to measure performance;
- the accuracy of the calculations of the final performance; and
- the force majeure and other exclusions to accord with the service standards guidelines.

SKM met with ElectraNet SA staff in Adelaide on Wednesday 7 April 2004, to review their data systems and procedures for gathering and processing outage information. The integrity of the system established by ElectraNet SA for retrieving data from the Events Database for reporting under both internally and the ACCC PI Scheme was audited. As a result of audit activities undertaken, Sinclair Knight Merz has formed an opinion that:

- the performance reporting by ElectraNet SA was free from material errors and was in accordance with the requirements of the ACCC service standards guidelines;
- ElectraNet SA correctly applied the PI Scheme formulas and coefficients to calculate the performance incentive amount using the equations contained in the revenue cap decision[1];
- the recording system used by ElectraNet SA to capture outage data is accurate and reliable;
- the categorisation of assets was consistent with the historical categorisation;
- the application of exclusions was in accordance with historical calculation of performance; and
- the application of the force majeure to the incident at Mannum-Adelaide no. 2 pumping station substation was within the agreed definition.

SKM recommends:

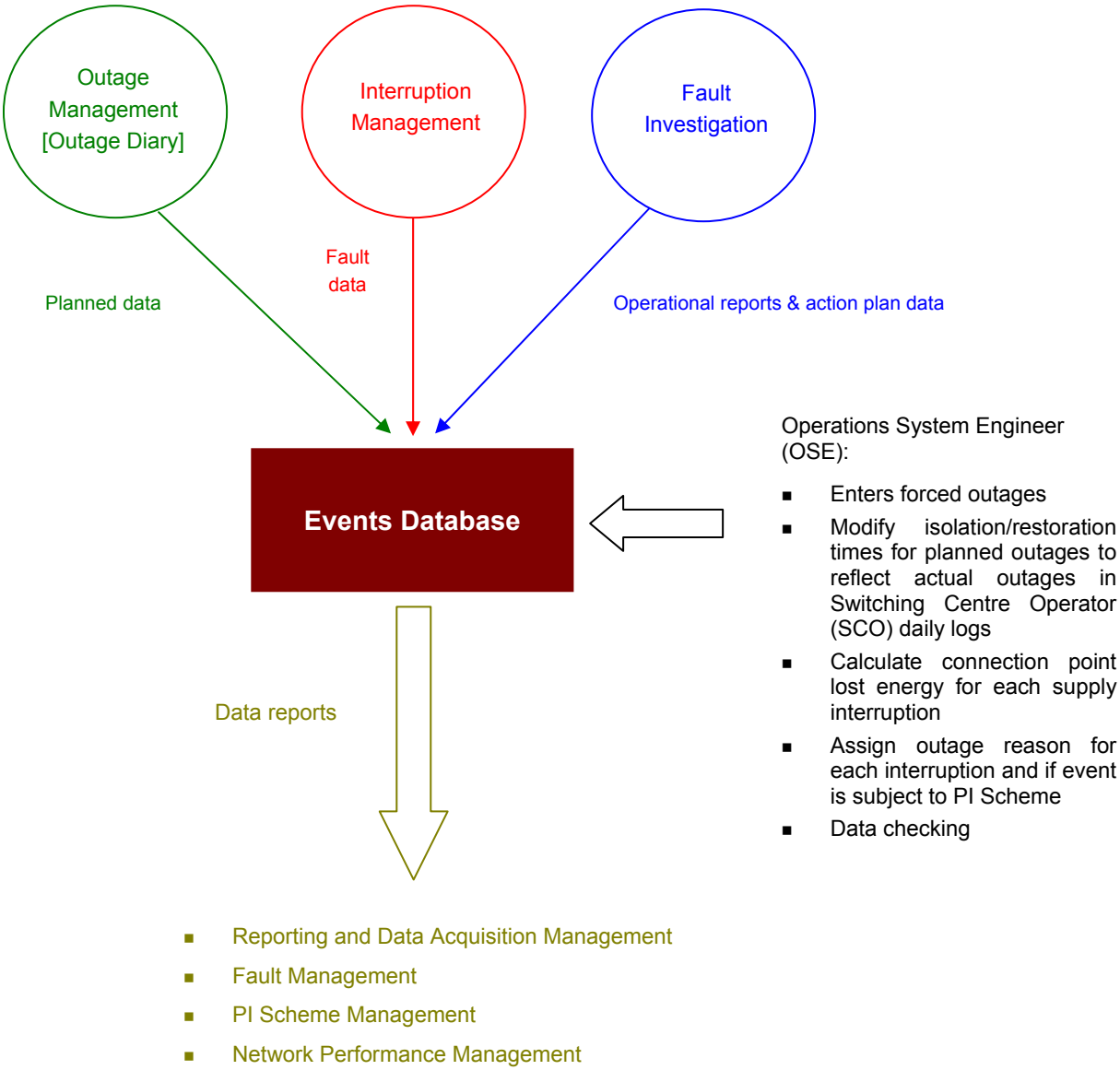
- ElectraNet SA's calculation of its S factor and performance incentive be accepted as free from material errors;
- The ACCC accept the force majeure exclusion sought by ElectraNet SA.; and
- The bonus for ElectraNet SA under the ACCC PI Scheme for 2003 is **$1,118,748.**

[1] The original revenue cap decision contained errors in the table in Appendix 6. The formulas contained in Appendix 7 are the correct figures, and the ACCC has written to ElectraNet SA with a corrected Appendix 6 table. The correct figures have been used by ElectraNet SA to calculate its performance incentive.

2. Recording System

An overview of the ElectraNet SA transmission performance data management process is shown in Figure 2-1.

- **Figure 2-1 Transmission Performance Data Management Process**



2.1 Events Database

The Events Database was developed in-house using Oracle. Data entry is currently based on a series of manual inputs, although the system is being developed and more direct data input methods would be employed in the future.

Operators in the Switching Operation Centre maintain written (paper) daily log sheets which are submitted at the end of each shift for review by the System Monitoring and Switching Manager (SMSM). The daily handwritten logs are then converted to electronic logs using a database system. The Operations System Engineer (OSE) subsequently uses the electronic logs to review events and cross check the start and finish times for outages with the SCADA records. The hand written logs are archived, and the past twelve (12) months of typed logs are kept with the OSE for quick reference to recent events.

Certain defined events, such as forced outages, automatically generate an email from the operator in the Switching Operation Centre to a defined list of staff, advising of the details of the incident.

Planned work is recorded in the Outage Diary, which is entered into the Events Database. The OSE reviews each planned outage against the daily logs and SCADA records to modify the isolation and/or restoration times to reflect actual times. Each planned outage is part of the System Switching Program and carries a SSP number for easy identification.

All relevant events from the logs, interruption reports, and the outage diary are entered into the Events Database[2]. Fault investigation reports are used in some cases to establish the cause of outages, and to assign the appropriate classification (eg included/excluded).

For each outage, the Operation System Engineer calculates the unserved energy using actual load data from revenue metering, reviews the cause for the outage and codes the event for calculation of performance under the PI Scheme. This coding is checked by others as part of the operational report for each event, and modified if the original categorisation is deemed inappropriate. It was noted that the original coding is not overwritten, but updated, so that there is a history maintained for this coding phase.

2.2 Categorisation and Exclusions

The reasons for each event are considered at the time events are entered into the Events Database, and excluded events are “tagged” in the database. Separate database fields for each of the defined performance measures allow events excluded from one measure to be included in another, as

[2] ElectraNet SA are currently investigating replacing the written daily logs with the operators entering the details of events directly from their scrap logs to the Events Database.

appropriate (eg outage duration, energy not served, outage > 0.2 minutes).

2.3 Processing of Outage Data

ElectraNet SA have developed database queries and reports that extract relevant data from the Events Database for further analysis in a spreadsheet for PI Scheme analysis and reporting.

The Events Database acts as a single information source for PI Scheme reporting, with all relevant events exported to spreadsheets for summation and analysis. There is a separate sheet for each performance indicator, listing total events for that indicator, and a separate total after force majeure exclusions. A cover sheet summarises the results for each performance indicator, and calculates the S factors and revenue bonus/penalty.

2.4 Calculation of Performance Measure Results

The performance measure results are calculated using the S-factor equations defined in the South Australian Transmission Network Revenue Cap decision (2002). The Commission has written to ElectraNet SA clarifying the discrepancies between Appendices 6 and 7 of the original decision document, and confirming that the equations in Appendix 7 prevail over the figures in Appendix 6. ElectraNet SA have applied the equations and coefficients from Appendix 7.

2.5 System Audit Findings

During 2003 there were 300 events contributing to circuit availability, and 12 outages. SKM conducted sample testing of Control Room daily logs, tracking events from the paper logs, to electronic logs, to the Events Database, and finally to the spreadsheet reports. The tests confirmed that each of the events had been correctly transferred through the various systems, with the date, time and other details intact. SKM was satisfied the reasons and classification for each event was reasonable and in accordance with historical reporting protocols.

SKM also reviewed the Energy Not Served (ENS) calculations for two events included in the sample set, and was satisfied that the basis and calculation of ENS to be reasonable and to provide a good estimate of actual energy not served due to outages. ElectraNet SA uses NEMMCO revenue metering as the basis for ENS calculations, comparing profiles on similar days with the profile on the day of the outage, and uses the difference to estimate the ENS.

ElectraNet SA have classified one event as subject to force majeure conditions, and has estimated the time when it was responsible for circuit unavailability (the time from the outage to crews arriving on the site), and the time due to events reasonably beyond its control (the time crews were unable to rectify the fault due to high wind conditions). SKM considers this approach and ElectraNet SA's estimates of the times as reasonable, and supported by available documentation.

3. Exclusions

The ACCC service standard guidelines noted that the PI Scheme adopted standard definitions for performance measures to ensure that TNSPs have similar incentives, whilst recognising that these definitions needed to be flexible.

It was highlighted that the definitions should align with appropriate information that the TNSP has been collecting historically to ensure that performance is measured consistently over time to preserve the incentive to improve. The audit identified the events that have been excluded in the past.

3.1 Excluded events

For each of the performance measures applicable to ElectraNet SA, there are different exclusions specified for each. These exclusions are shown in Table 3-1 for each of the performance indicators.

Shaded areas represent exclusions applied by ElectraNet in line with historical practice that are not explicitly listed in the ACCC PI Scheme (as per the South Australian Transmission Network Revenue Cap decision (2002)).

Table 3-1 Exclusions for ElectraNet SA performance indicators

Circuit Availability	Loss of Supply Event Frequency Index	Average Outage Duration	Transmission constraints (Intra & Inter regional)
Unregulated transmission assets;	Unregulated transmission assets	Unregulated transmission assets	Connection assets (Intra regional only)
3rd party initiated events (TNSPs, generators, customers, NEMMCO)	3rd party initiated events (TNSPs, generators, customers, NEMMCO)	3rd party initiated events (TNSPs, generators, customers, NEMMCO, faults causing correct operation of ElectraNet protection)	3rd party initiated events (other TNSPs, Inter regional only)
Extended outages for major line rebuilding	Planned outages	Planned outages	Non-credible generator contingencies coinciding with planned outages
	Successful reclose within one (1) minute	Momentary interruptions (<1 minute)	Constraints due to line ratings rather than outages
Force majeure	Force majeure	Force majeure	Force majeure
Voltage control [3] (load shedding) where circuit is available for	Outages resulting from an interconnector outage are capped to	Outages resulting from an interconnector outage are capped to	

[3] Circuit switched out to provide actual or contingency voltage control.

Circuit Availability	Loss of Supply Event Frequency Index	Average Outage Duration	Transmission constraints (Intra & Inter regional)
immediate restoration	thirty (30) minutes	thirty (30) minutes	
Opening of only one end of a transmission line ie. where the transmission line remains energised and available	SA Water pumping station supply outages (refer section 3.2)		

3.2 SA Water

Interruptions involving SA Water pumping stations are included in Average Outage Duration performance calculations but excluded from the Loss of Supply Event Frequency Index. This is due to two main considerations:

- These interruptions were excluded from historical data used in setting performance targets under the ACCC PI Scheme, as pumping station loads are highly irregular, which makes any accurate estimation of load profiles and therefore projected energy lost very unreliable; and
- SA Water pumping stations are classified as Category 1 loads under the South Australia Transmission Code, and were historically interruptible by ElectraNet and therefore excluded from any calculations of lost system minutes.

The Transmission Code defines a Category 1 load as

> *"A transmission entity shall not contract for an amount of agreed maximum demand greater than 100% of installed line capacity. A transmission entity shall have no obligation to provide N-1 line capacity [4] beyond that necessary to maintain power system performance and quality of supply standards under the National Electricity Code. A transmission entity shall use its best endeavours to restore the contracted line capacity within 2 days of an interruption."*[5]

4 N-1 means the ability of the transmission system to continue to supply loads connected to the system in the event of a "worst case" outage of any single element (line, transformer, busbar, circuit breaker…)

5 Section 2.2.2, Electricity Transmission Code, Essential Services Commission of South Australia, 2003.

3.3 Audit Findings

During 2003, there were 353 events recorded for transmission line circuit outages, and 31 connection point events (55 connection point interruptions)[6]. The number of exclusions, and primary cause for exclusion, are shown in Table 3-2 and Table 3-3.

Table 3-2 Transmission line outages

Outage type	No. of events	Hours	Notes
Included events	300	3,873.05	
Excluded events	36	803.63	Customer requests
	11	320.66	Not a regulated transmission line or asset
	4	19.76	Under frequency load shedding
	1	5.35	Failure of third party equipment
	1	10.02	SPI PowerNet request for maintenance [7]
Subtotal	*53*	*1,159.42*	
Total	**353**	**5,032.47**	

Table 3-3 Connection point events

Outage type	No. of events	Minutes	System minutes[8]	Notes
Included events	12	1,683	3.752	
Excluded events	12	0	-	Successful reclose after lightning strike
	2	0	-	Momentary interruption
	4	499	1.849	Failure of third party equipment
	1	705	-	Force majeure (refer section 4.2)
Subtotal	*19*	*1,204*	*1.849*	
Total	**31**	**2,887**	**5.601**	

[6] A single event may affect a number of separate connection points eg. event 1007 of 16.01.2003 affected 3 separate connection points – Murray/Hahndorf 2, Murray/Hahndorf 3 and Kanmantoo Mine.

[7] SPI PowerNet undertook maintenance on the Heywood interconnector on 10 April, commencing the outage at 7:33am (Eastern Standard Time) for 10.05 hours. This outage was included in the performance results for SPI PowerNet. The ElectraNet SA Events Database records the outage as commencing at 7:03am (Central Standard Time) for 10.02 hours.

[8] System Minutes are calculated for each individual connection point affected by an event. It is calculated as *System Minutes = Average Load Lost (MW) * Outage Duration (minutes) / System Maximum Demand*

Table 3-4 summarises the overall results by included and excluded events. This shows that approximately 85% of all transmission line circuit outages and 39% of the connection point events were included in the performance measure calculation.

Table 3-4 Summary of inclusions and exclusions

Category	Total no. of events		Total Duration	
	Included	Excluded	Included	Excluded
Transmission line circuit outages	300 (85%)	53 (15%)	3,873 (77%)	1,159 (23%)
Connection point events	12 (39%)	19 (61%)	1,683 (58%)	1,204 (42%)

The audit identified that the categories used for designating exclusions are generally in accordance with the exclusions defined with the ElectraNet SA determination. The exception is system minutes[9] associated with SA Water outages, which have been excluded in accordance with historical reporting protocols.

SKM considers the application of these exclusions by ElectraNet SA is reasonable, in light of performance targets based on historical data.

[9] System minutes are used in the calculation of the Loss of Supply Event Frequency indices.

4. Force Majeure

In the Service Standards Guidelines published by the Commission[10], there are four (4) considerations listed for determining what force majeure events should be "excluded force majeure events". These are:

- Was the event unforeseeable and its impact extraordinary, uncontrollable and not manageable;
- Does the event occur frequently – if so, how did the impact of the particular event differ;
- Could the TNSP, in practice, have prevented the impact (not necessarily the event itself); and
- Could the TNSP have effectively reduced the impact of the event by adopting better practices?

4.1 Definition

The definition used by ElectraNet SA in the determination of performance under the ACCC PI Scheme reflects the determination outlined in the ACCC service standards guidelines and which was used historically in processing performance data (see Appendix B for details).

4.2 Mannum – Adelaide No. 2 Pumping Station Substation

At approximately 8:10pm on 5 June 2003, the 132kV Ganged Interrupter tripped, isolating supply to two (2) transformers at Mannum – Adelaide No.2 Pumping Station Substation and interrupting supply to SA Water. The ETSA Utilities repair crew arrived 2 hours later, and reported to ElectraNet that the windy conditions were extreme, assessed that the work could not be performed safely and decided to return to the site later.

A second crew attended approximately 4 hours later and found the wind conditions were still extreme. The site was subsequently inspected at regular intervals to determine when the weather conditions had changed sufficiently to allow the replacement of the Ganged Interrupter to be performed safely. At approximately 9:50am on the following day, the winds, whilst still strong, had abated sufficiently for the repair work to be done. Power was finally restored at 12:15pm on the afternoon of 6 June 2003. In total, supply was interrupted for 16 hours.

[10] Schedule 2, Statement of principles for the regulation of transmission revenues – Service standards guidelines, ACCC, 12 November 2003

ElectraNet SA conducted an investigation into the cause of the incident, together with reviewing the actions of the field crews. It was concluded that the Ganged Interrupter had been tripped by a failure in a Winding Temperature Indicator on Transformer No. 1 as a result of vibration from the extreme windy conditions. The Ganged Interrupter elements that required replacement were glass tubes filled with a toxic liquid, approximately 1200mm long, 76 mm in diameter and weighing 11kg. The work required the use of a special boom to lift the elements in position, and for repair crew personnel to work from step ladders.

4.3 Audit Findings

As part of the supporting documentation provided by ElectraNet SA, weather reports from the Bureau of Meteorology (BoM) confirmed that winds on the 5th and 6th of June 2003 averaged between 65-80 km/h with gusts of up to 110 km/h, and that these conditions persisted for up to sixteen (16) hours. These wind speeds are classified as strong gale force, and the typical effects of such winds include large branches breaking off trees, shallow rooted trees are pushed over, structural damage occurs (tiles blown off roofs, fences and power lines brought down) and difficulty experienced in walking.

BoM historical anemometric information shows that the typical winter winds in the Adelaide districts reach approximately 20-30 km/h, with an average wind speed of 12 km/h for June. Less than 1% of the measured wind speeds during June typically exceed 46 km/h, with the average maximum wind gust reaching 67 km/h. This data suggests that the wind conditions experienced on the 5th and 6th of June were both abnormal and extreme.

The ETSA Utilities Field Services Instruction for safe working from elevating work platforms (EWPs) states that *"... EWPs **must not** be operated during high wind conditions (above 15 metres per second or 54 km/h measured at ground level in an unobstructed position)."*[11] This supports the crews' assessment that it was unsafe to replace the Ganged Interrupters between 8:10pm on 5 June until 9:50am on 6 June.

The available evidence to SKM demonstrated that the weather conditions, and in particular the wind, was extreme during the restoration delay. The crews assessed that to undertake the repair work requiring the manipulation of bulky, fragile and potentially hazardous plant in the high winds being experienced would have been unsafe, in accordance with established ETSA Utilities safe working procedures.

The categorisation of this event as a force majeure event is considered appropriate under the definition provided in Appendix B.

[11] pp 34, clause 6.14 (1), Field Services Instruction ref no. FSI-1T7, ETSA Utilities, June 2003.

4.4 Recommendation

SKM recommends ElectraNet SA's classification of part of this event as the result of force majeure be accepted, and that ElectraNet SA's estimate of the time for which it is responsible and the time subject for force majeure exclusion also be accepted.

5. Calculation of Bonus / Penalty

The results provided by ElectraNet SA were entered into the PI Scheme model provided to the ACCC. The bonus calculated varied marginally from the value calculated using the S-factors outlined by the Commission in the revenue determination[12] of 11 December 2002 due to some rounding off of coefficients.

The differences between the two calculations are shown in Table 5-1.

Table 5-1 Calculated Bonus

No	Performance Measure	Calculated bonus / (penalty)		% variation to SKM values
		ACCC S-factors	SKM	
1	Circuit Availability (total)	512,253	523,532	(2.20%)
2a	Loss of Supply Event Frequency Index > 0.2 mins	106,403	96,238	10.56%
2b	Loss of Supply Event Frequency Index > 1.0 mins	121,603	115,485	5.30%
3	Average Outage Duration	378,489	383,282	(1.25%)
	TOTAL	**1,118,748**	**1,118,536**	**0.02%**

These calculations have been done for comparative purposes only, as the final calculation of the bonus or penalty is based on the S-factor equations defined in the ACCC determination[13]. The profile for each of the applicable measures are shown in Appendix A, based on the performance results calculated using the exclusions outlined in Section 3.

Based on these results, SKM considers the calculation by ElectraNet SA of its S-factor and performance incentive to be free of material errors, subject to ACCC acceptance to the force majeure exclusion sought by ElectraNet SA. The bonus for ElectraNet SA under the ACCC PI Scheme for 2003 is **$1,118,748**.

[12] South Australia Transmission Network Revenue Caps 2003-08, ACCC, 11 December 2002.

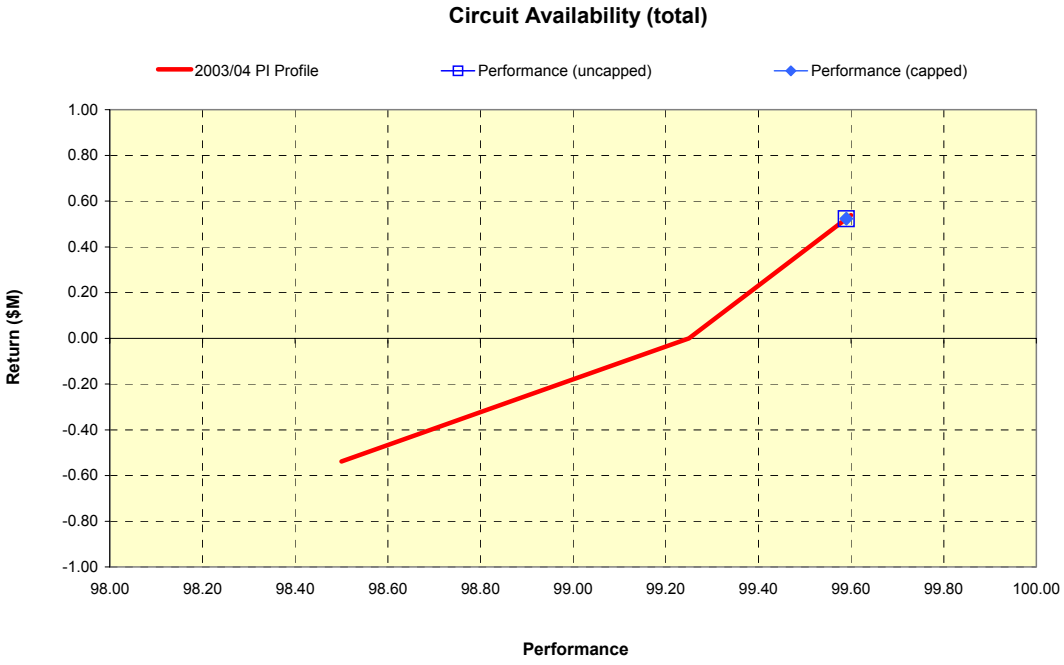
[13] Appendix 7

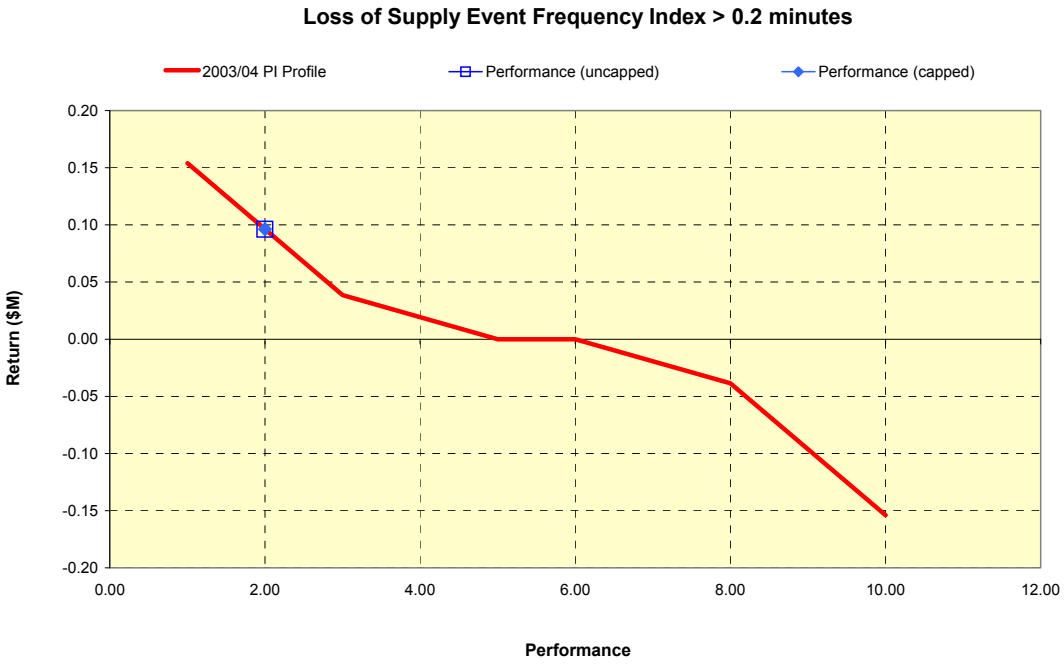
Appendix A Performance Measure Profiles

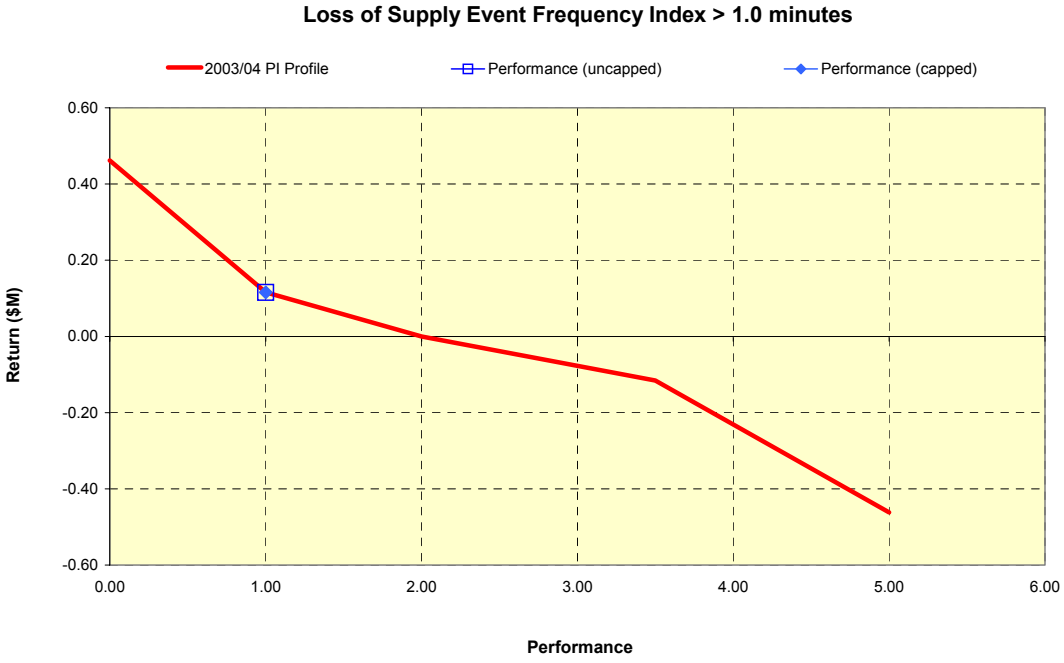
The Performance Measure profiles graphically illustrate the 2003 performance against the targets for Circuit Availability and Average Outage Duration.

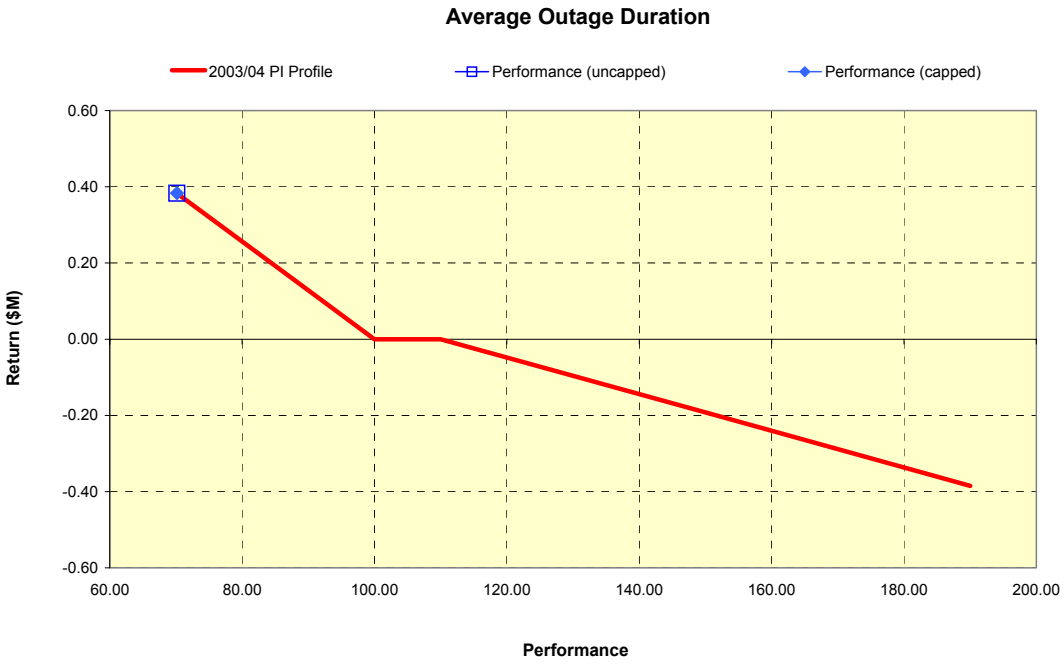
The profiles shown are:

- Measure 1 Circuit Availability (total)
- Measure 2a Loss of Supply Event Frequency Index > 0.2 mins pa
- Measure 2b Loss of Supply Event Frequency Index > 1.0 mins pa
- Measure 3 Average Outage Duration




Loss of Supply Event Frequency Index > 0.2 minutes
2003/04 PI Profile
Performance (uncapped)
Performance (capped)
Return ($M)
0.20
0.15
0.10
0.05
0.00
-0.05
-0.10
-0.15
-0.20
0.00
2.00
4.00
6.00
8.00
10.00
12.00
Performance


Loss of Supply Event Frequency Index > 1.0 minutes
2003/04 PI Profile
Performance (uncapped)
Performance (capped)
Return ($M)
0.60
0.40
0.20
0.00
-0.20
-0.40
-0.60
0.00
1.00
2.00
3.00
4.00
5.00
6.00
Performance


Average Outage Duration
2003/04 PI Profile
Performance (uncapped)
Performance (capped)
Return ($M)
0.60
0.40
0.20
0.00
-0.20
-0.40
-0.60
60.00
80.00
100.00
120.00
140.00
160.00
180.00
200.00
Performance

Appendix B Definition of Force Majeure

The ACCC Revenue Cap decision does not contain a formal definition for force majeure.

On 6 February 2003 the Commission wrote to ElectraNet SA clarifying discrepancies between the coefficients in Appendix 6 and Equations in Appendix 7 of the decision. At this time the Commission included the following definition of force majeure:

"*... third party and natural events for which the TNSP can not be reasonably expected to cater for*"