

Audit of Transend Service Standards Performance Reporting

PERFORMANCE RESULTS FOR 2006

- Final Report
- 4 April 2007



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1. Executive Summary

Sinclair Knight Merz (SKM) was engaged by the Australian Energy Regulator (AER) to conduct an audit of the year 2006 performance report of Transend based on the AER service standards established in the AER Determination for 2004-2008/09.

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

- any refinements or additions to the recording system used to measure performance;
- the accuracy of the calculations of the final performance; and
- the force majeure events and/or other exclusions to ensure compliance with the revenue cap decision and AER service standards guidelines.

SKM and a representative from the AER met with Transend staff in Hobart on Tuesday 27 February 2007, to review their data systems and the integrity of the system established by Transend for retrieving data from the PROMS¹ and RIMSys databases, and to investigate specific events proposed for exclusion.

As a result of audit activities undertaken, SKM has formed an opinion that:

- the performance reporting by Transend was free from material errors and in accordance with the requirements of the AER service standards guidelines;
- the recording system used by Transend to capture the relevant details for outages is accurate and reliable;
- the application of exclusions was in accordance with defined exclusions and historical calculation of performance.

SKM recommends that:

- Transend's calculation of its S-factor be accepted as free from material errors;
- the proposed exclusion for extended outages within Transmission Circuit Availability related to events in Beaconsfield in April and May 2006 be changed from a third party event as requested by Transend to a force majeure event and be accepted;
- the outages categorised as *Generator Request* be accepted as an exclusion as customer requests within the defined exclusions of transmission line availability;
- the events within the *Generator Shared* category are outages caused by an event on a third party installation, and should be accepted as exclusions as these particular types of outages reflect sound maintenance practices that the PI Scheme is seeking to encourage, subject to

¹ Plant Restriction and Outage Management System



additional verification in future audits that Transend maintenance activities have not extended the outage beyond that required by Hydro Tasmania;

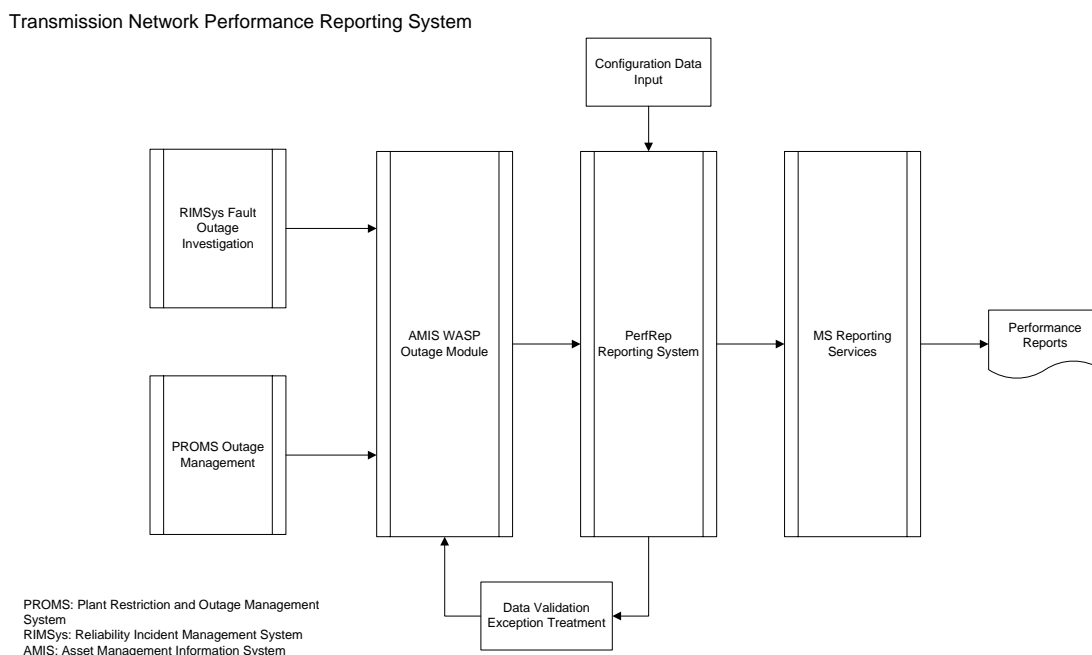
- the proposed exclusion for the event on 23 May 2006 that resulted in under frequency load shedding of industrial load in accordance with the findings of the NEMMCO investigation be accepted; and
- based on the acceptance of the proposed exclusions being consistent with standard performance measures in the AER Transend Determination, the bonus recommended under the AER PI Scheme is **0.0625% of the Annual Revenue for the 2007/2008 financial year.**



2. Recording System

An overview of the Transend performance reporting system is shown in Figure 1.

■ **Figure 1 Performance Report Process**



The performance reporting process uses as its primary data source, records of all planned and unplanned outages (which are recorded in the PROMS database) and all fault initiated outages (recorded in the RIMSys fault database).

Transend have documented the procedure for the extraction, analysis and sorting of data and the processing of results for the production of monthly transmission system performance reports.



2.1 Outage Details

For each planned or unplanned outage or operation on the transmission system, and incidence where personnel are working in or near apparatus inclusive of a substation, a works order is initiated through PROMS. This work order documents the known details of any outage and the nature of work required. The PROMS record is the record by which network security, scheduling, resourcing and other isolation related events are initiated and logged against. No planned or unplanned network switching can occur without a PROMS request having first been initiated, researched, approved and scheduled.

All faults that occur on the transmission system that cause the operation of a protection device are recorded on the fault database. These records are initiated by the shift network operators and are generated in the early stages of investigating the cause of the fault by field service groups.

The PROMS and Fault databases represent all of the databases used to capture transmission system operations and activities. As both of these databases are maintained by the network operations group, who control, monitor and operate the transmission system for Transend, SKM is satisfied that they represent an accurate record of all outage events on the system.

2.2 Processing of Outage Data

Extraction of the raw data events is manually conducted on a monthly basis. Extraction of information consists of a download of all events for the month from each system into the PerfRep system. The raw data is then filtered to remove non-network element outage causing events. This represents a significant culling of records.

The remaining records are then individually reviewed to ensure credibility of element outage and restoration times.

2.3 Categorisation and Exclusions

The events are further manually reviewed to determine if the initiating event qualifies the outage for inclusion or exclusion in the performance reporting scheme.

SKM noted that Transend has developed an internally approved document² which defines the measures to be used when reporting for the AER on performance, and defines the performance incentive scheme. The performance measures contained in this document detail assets and events that should each be considered either an inclusion or exclusion for the determination of performance result.

² Transend, *AER Service Standards - Terms and Measures TNM-GS-809-0099 Issue 1.0*, February 2005



2.4 Further Processing of Outage Data and Validation

Transend have developed an in house package "PerfRep" that analyses the raw data downloaded from the PROMS and fault databases and also analyses the events for performance qualifying events.

This algorithm performs validation checks on outage data and allows treatment of exceptions. SKM considered this a useful check mechanism for verifying the primary source of data.

The outage lists provided to SKM and the AER for the 12 month review period included the full details of the outage events, including cross references to both asset management and outage management systems.

2.5 Calculation of Performance Measure Results

The performance measure results are calculated using the AER performance incentive model that contains S-factor equations defined in the Transend revenue cap decision (2004-2008/9). The results are displayed on a graph (refer Appendix A) illustrating the S-factors proposed by Transend and recommended by SKM.

2.6 Recording System improvement

During the 2006 audit, Transend demonstrated an automated system that has significantly reduced the manual input associated with retrieving and processing the relevant records from the PROM and RIMSys databases. This new reporting module uses event categorisation to develop performance reports for circuit and transformer availability on a monthly basis, together with an annual result for use in the PI Scheme performance calculations.

2.7 AER Performance Excel spreadsheet

SKM has previously reviewed the accuracy of data recorded on the Excel spreadsheets for a number of events throughout the year. Specifically, SKM reviewed the accuracy of outage commencement and restoration times against actual circuit breaker operation times and transmission line and transformer current flows as recorded on the Transend system event log. The input to this log is the actual time stamped element operation time load flows taken directly from the SCADA system. This is a real time system, and SKM considers its accuracy to be excellent and best electricity industry practice.



2.8 System Audit Findings

SKM remains satisfied that the recording and data processing systems that have been put in place by Transend accurately log and calculate performance. The reporting enhancements put in place during 2006 have removed the possibility of manual error which potentially may have occurred previously. The allocation of exclusions is in accordance with Transend's interpretation of the prescribed list of exclusions.



3. Exclusions

The AER reliability incentive scheme contains provision for certain defined events to be excluded from calculated outage figures.

In an internal document, Transend has developed tables which define the measures to be used for each of the performance measures.³ A separate table has been developed for each of the performance measures and clearly lists such measures as; units of measure, sources of data, definitions/formula, exclusions and inclusions.

However, SKM noted that in the 2003 Transend revenue cap decision, the ACCC did not adopt Transend's proposed list of excluded events, noting that the ACCC considered that "... *better outcomes will be reached by an annual review of exclusions. The ACCC requires Transend to report its raw performance data and its proposed exclusions separately.*"⁴

Therefore, each exclusion has been individually examined, and compared with the standard exclusions for each performance measure, and the provisions of Force Majeure.

3.1 Submitted Performance Results

Table 1 summarises the submitted Transend 2006 performance results by included and excluded events.

■ Table 1 Summary of Overall Performance With And Without Excluded Events

Performance Measures	Performance with Exclusions		Performance without Exclusions	
	Result	Transend Proposal	Result	Transend Proposal
S1: Transmission Line availability - % Available	99.21%	0.0125%	98.23%	(0.2500%)
S2: Transformer Circuit availability - % Available	98.80%	(0.1500%)	98.80%	(0.1500%)
S3: Loss of Supply Frequency Index > 0.1 Minutes	16 Events	0.0000%	17 Events	(0.0500%)
S4: Loss of Supply Frequency Index > 2.0 Minutes	1 Events	0.2000%	2 Events	0.0000%
Total		0.0625%		(0.4500%)

³ Transend, *AER Service Standards - Terms and Measures TNM-GS-809-0099 Issue 1.0*, February 2005

⁴ ACCC, *Tasmanian Transmission Network Revenue Cap: Decision*, 10 December 2003, section 8.4, pp 106



3.2 Proposed Exclusions

In the submission to AER, there are three (3) events or categories of events that Transend proposes to exclude from their performance measure calculations. These events are:

- The effect of halting transmission line switching during the rescue of two miners trapped underground at Beaconsfield;
- Multiple circuit outages during 2006 that occurred whilst Hydro Tasmania was undertaking work on its generation and connection assets; and
- Loss of supply event that occurred on:
 - 23 May 2006 due to a frequency excursion on the Tasmanian transmission system due to activities of Hydro Tasmania and Basslink.

For each event, Transend provided detailed incident reports, including additional information requested by SKM during the audit, to support the proposal for an exemption for these events.

3.2.1 Beaconsfield

In April 2006, Transend was undertaking line reconfiguration work at George Town substation to provide a tee-off for a new gas fired generation unit that was being installed at Bell Bay Power Station.

On Tuesday 25 April 2006, a small earthquake caused a rock fall in the Beaconsfield gold mine, approximately 10km from George Town substation. Of the 17 people who were in the mine at the time, 14 escaped immediately following the collapse, one was killed, and the remaining two were found alive after five days nearly a kilometre below the surface. These two miners were freed on Tuesday 9 May, a full two weeks after being trapped.

During the rescue, Aurora Energy requested Transend to cease all maintenance and capital work that was in progress in the vicinity of Beaconsfield, and to avoid any switching that could potentially affect the supply to the mine. The transmission system was to be held in the configuration that existed on 26 April. Transend complied with this instruction, and positioned maintenance crews at strategic points around the transmission system so that any fault that may have occurred would be addressed without delay.

SKM has reviewed the outage list, and understands that the exclusion is sought for unavailability of the 110kV Bell Bay - George Town line which extended beyond the time required for that required by Hydro Tasmania to complete the work at Bell Bay Power Station as a result of the request for security of supply to Beaconsfield. There were 5 recorded events on PROMS request 105003, totalling approximately 1,361 hours.



SKM is satisfied that the intention of the original outage was to allow Hydro Tasmania to undertake the installation of the new gas turbine at Bell Bay Power Station, and would therefore, under normal circumstances, have been regarded as an exclusion from Transmission Circuit Availability (measure 1) as a customer request.

Transend has applied for this event as an exclusion due to a third party outage. SKM does not agree with this categorisation, as the original outage related to maintenance work which extended a generator requested outage beyond that required by Hydro Tasmania and would therefore be included in the performance calculation, under normal conditions, as an unavailable asset. However, in this case, SKM considers that the extraordinary circumstances surrounding this event satisfy the provisions of Force Majeure as it was an extreme event beyond the control of Transend.

As a force majeure event, SKM would recommend that this proposed exclusion be accepted.

3.2.2 Generator Requested and Co-ordinated Outages

The structure of the Tasmanian region provides a unique opportunity for Transend to co-ordinate some of its transmission system maintenance with outages requested by generators for work on their connection assets or generation units.

Currently, the Tasmanian market consists of one principle generator (Hydro Tasmania), one distribution company (Aurora Energy) and Transend and National Grid Australia (Basslink) as the transmission entities. In planning maintenance activities, Transend has monthly discussions with both Hydro Tasmania and Aurora to investigate any opportunities to co-ordinate an outage so as to minimise the impact on the Tasmanian transmission system. During the audit, Transend demonstrated the procedure for comparing outage requests planned for the upcoming month, and the planning that is done to co-ordinate any work.

Table 2 shows the breakdown of outages associated with Hydro Tasmania during the reporting year 2006.



■ **Table 2 Generator related outages⁵**

Type	Planned		Unplanned		Forced		Fault		Total	
	Events	Hrs	Events	Hrs	Events	Hrs	Events	Hrs	Events	Hrs
Generator Request	74	4,981.38	38	1,987.07	4	21.12	5	12.50	121	7,002.07
Generator Shared	23	331.60	1	32.63	-	-	-	-	24	364.23
Total	97	5,312.98	39	2,019.70	4	21.12	5	12.50	145	7,366.30

Outages that are requested solely for the purpose of work by Hydro Tasmania are categorised as *Generator Request*, and SKM would consider these events to be customer installation or requests, which are regarded as exclusions under the definition for Transmission Circuit Availability and Transformer Availability (measures 1 and 2). During 2006, Hydro Tasmania completed the commissioning of 3 off 38.75MVA gas fired turbines at Bell Bay Power Station, together with the upgrade of transmission lines to allow for the simultaneous operation of the existing Bell Bay units and these additional gas turbines.⁶

SKM is of the view that Transend follows good electricity industry practice in co-ordinating with NEMMCO, other market participants and customers regarding the maintenance work on its transmission assets and that this should be encouraged. One of the guiding principles adopted during the development of the service standards was that TNSPs should be encouraged to be “... *innovative in their business operations so as to improve performance and reduce costs that will ultimately provide economic benefits to the market as a whole.*”⁷ SKM considers that the co-ordination of works between Transend and Hydro Tasmania contributes to the overall performance of the transmission system, and should continue to be encouraged through the PI Scheme.

SKM considers that events that are categorised as *Generator Shared* are outages “... *shown to be caused by a fault or other event on a third party system eg. ... generator outage, customer*

⁵ The number of events included in Table 2 represents the number of outages reported by Transend with the different categorisation of Planned/Unplanned/Forced/Fault. It was noted that a single PROMS request related to the entire job which occurred on separate days or weeks, was reported as multiple events. The total number of Generator Request PROMS requests was 97, whilst for Generator Shared, there were 9 PROMS requests.

⁶ The work on the Bell Bay - George Town lines accounted for 21 events that totalled 2,152.40 hours of the *Generator Request* outages

⁷ SKM, *Transmission Network Service Provider Service Standards: Final Report*, 24 March 2003, pp 12



installation”⁸. As such, SKM would recommend that *Generator Shared* outages should be accepted for exclusion, excepting for any period of time where the outage is extended to allow for Transend maintenance, repair or capital works beyond that required by Hydro Tasmania. Such considerations would require Transend to report the duration of the outage required by the generator, and the total outage time to highlight any portion for which Transend would be required to include in their availability performance calculations as planned work.

For the 2006 audit, the total outage for *Generator Shared* is 364 hours, and it is not immediately evident if there were instances where the outage time was extended due to Transend activities. SKM would recommend the exclusion of these 364 hours for this audit, although future audits should require additional supporting documentation to allow for the determination of any extensions beyond the needs of Hydro Tasmania for shared outages.

3.2.3 System Event of 23 May 2006

Between 7:20am and 7:50am on Tuesday 23 May 2006, there were insufficient frequency control ancillary services available in Tasmania due to all available generation being used to meet the Tasmanian load with minimal export to Victoria via Basslink.

At 7:50am, the frequency control services were satisfied with the reversal of Basslink to allow for the importing of generation from Victoria to supplement the generators in Tasmania. The high frequency disturbances that result from a change in direction of flow on Basslink were rapidly controlled. At 7:55am, Basslink flow was again reversed to allow for a small Tasmanian export. On this occasion, the low frequency disturbances were not controlled, resulting in a sequence of generating unit trips and under frequency load shedding to occur. The system frequency on the Tasmanian transmission system dropped to 47.2Hz before recovering. Another reversal of Basslink at 8:06am in response to a direction by NEMMCO assured recovery and allowed reconnection of the load that had been shed.

The NEMMCO investigation⁹ reviewed the event in four separate stages:

- the period leading up to 7:50am;
- the Basslink reversal at 7:55am;
- the generation unit trips and under frequency load shedding that occurred at 7:59am; and
- the recovery and restoration.

⁸ AER, *Statement of principles for the regulation of transmission revenue – Service standards guidelines*, 12 November 2003, Schedule 1, stated exclusions for measures 1 and 2

⁹ NEMMCO, *Power System Incident Report : Tasmania 23 May 2006 - Final Report*, 14 September 2006



Each stage was analysed, with input provided by National Grid Australia, Hydro Tasmania and Transend, and an assessment by NEMMCO of the primary issues that arose. It was noted that Hydro Tasmania has challenged some of the assertions made by NEMMCO, and these are the subject of ongoing discussions.

The review identified a number of main contributory factors including:

- difficulty in controlling Basslink manually;
- ineffective attempts to control Basslink flow through constraint equations;
- insufficient frequency control ancillary service delivery;
- failure to follow dispatch instructions; and
- inappropriate tripping of generation units.

NEMMCO have recommended eleven (11) corrective actions to reduce the risk of a recurrence of this incident, with the majority shared between NEMMCO and Hydro Tasmania, and a review by National Grid Australia of internal procedures for manual control of Basslink in response to a NEMMCO direction.

SKM is satisfied that the NEMMCO investigation does not implicate Transend in any way as contributing to the incident. In its review of the third stage of the event relating to generation unit trips and load shedding, NEMMCO noted the disconnection of 33MW of industrial load at 07:59.18 hours and an additional 46MW approximately 7 seconds later. In its assessment, NEMMCO observed that “ ... *the under frequency load shedding [on the transmission system] operated correctly in accordance with its design and appropriately to restore Tasmanian power system security.*”¹⁰ Therefore, SKM considers that this event satisfies the stated exclusions within the performance measures for Loss of Supply Event Frequency Index (measures 3 and 4) as a third party inter-trip, and should be excluded from the performance calculations.

¹⁰ Section 2.3, pp 10



4. Force Majeure

In the Service Standards Guidelines published by the AER¹¹, 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 Transend in the determination of performance under the AER PI Scheme reflects the definition outlined in the AER service standards guidelines and which was used historically in processing performance data (see Appendix B for details).

4.2 Event

There were no events during 2006 for which Transend sought exclusion as a force majeure event. However, following consideration of the events surrounding the Beaconsfield event in April 2006 (refer section 3.2.1), SKM is of the view that this event should have been categorised as force majeure rather than a third party.

¹¹ AER, *Statement of principles for the regulation of transmission revenues – Service standards guidelines*, 12 November 2003, Appendix E, Schedule 2



5. Calculation of S-factors

Table 4 shows the results of S-factor calculation proposed by Transend and recommended by SKM following its audit of the Transend service performance report.

SKM confirmed that the Transend has used the S-factor equations contained in the revenue cap decision and correctly applied the formulas and coefficients to calculate the S-factors in their submission. In addition, SKM has audited and confirmed the results generated from the supporting files detailing the outages included and claimed for exclusion from the performance calculations.

■ Table 3 Performance Results

No	Performance Measure	Target	Transend without exclusions	Transend with all proposed exclusions	SKM without exclusions	SKM assessment
1	S1 - Transmission Line Circuit Availability	99.10%	98.23%	99.21%	98.23%	99.21%
2	S2 - Transformer Circuit Availability	99.00%	98.80%	98.80%	98.80%	98.80%
3	S3 - Loss of Supply Frequency Index (>0.1)	16	17	16	17	16
4	S4 - Loss of Supply Frequency Index (>2.0)	3	2	1	2	1

■ Table 4 Calculated S-factors

No	Performance Measure	Transend without exclusions	Transend with proposed exclusions	SKM without exclusions	SKM assessment
1	S1 - Transmission Line Circuit Availability	(0.2500%)	0.0125%	(0.2500%)	0.0125%
2	S2 - Transformer Circuit Availability	(0.1500%)	(0.1500%)	(0.1500%)	(0.1500%)
3	S3 - Loss of Supply Frequency Index (>0.1)	(0.0500%)	0.0000%	(0.0500%)	0.0000%
4	S4 - Loss of Supply Frequency Index (>2.0)	0.0000%	0.2000%	0.0000%	0.2000%
	TOTAL	(0.4500%)	0.0625%	(0.4500%)	0.0625%

The profiles for each of the applicable measures are shown in Appendix A to illustrate the performance in graphical terms. Based on these results, SKM recommends the bonus for Transend should be **0.0625% of the Annual Revenue for the 2007/08 financial year.**

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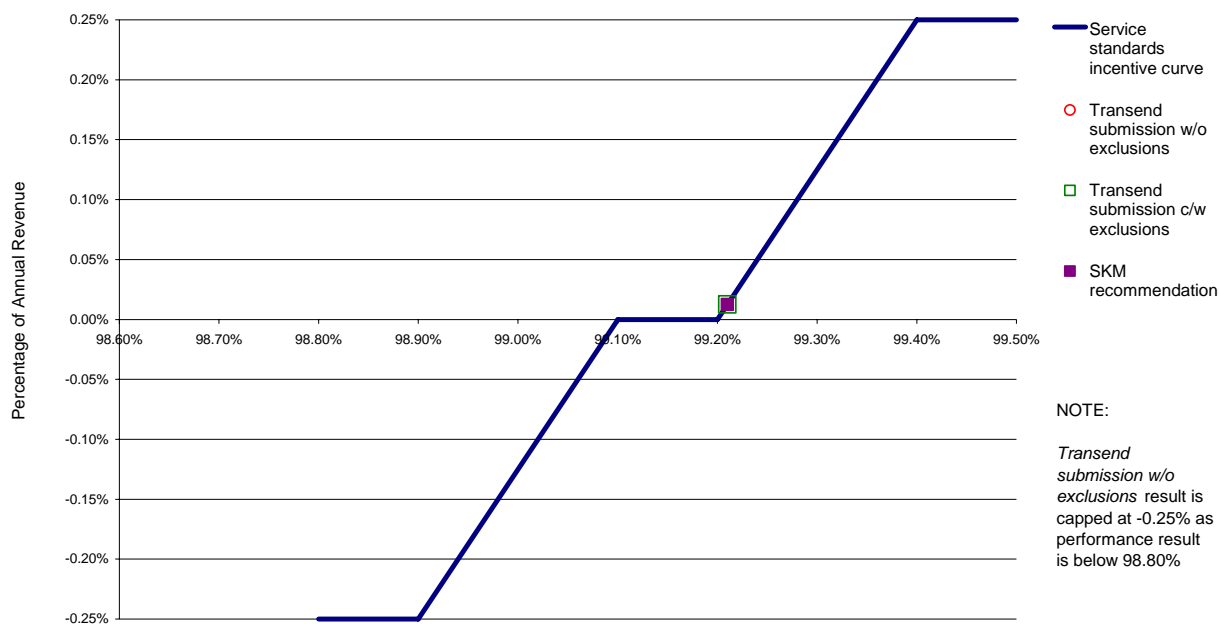
Appendix A Performance Measure Profiles

The Performance Measure profiles graphically illustrate the 2006 performance against the targets for Circuit Availability and Average Outage Duration, based on the exclusions sought by Transend and the SKM’s recommendation following its review.

The profiles shown are:

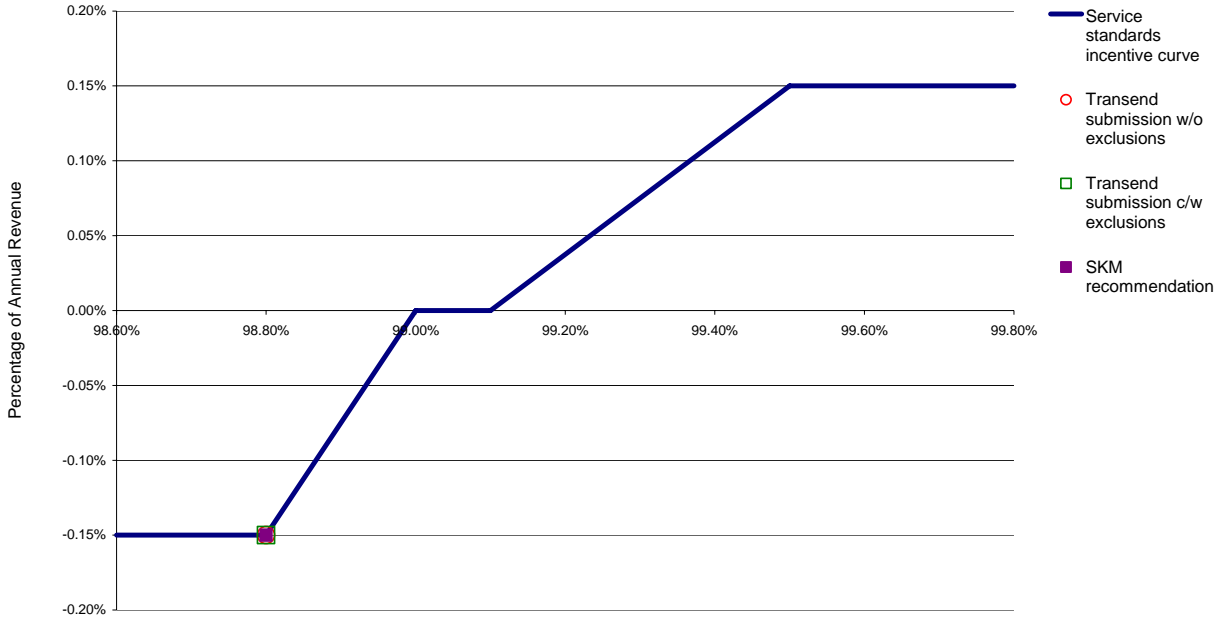
- Measure S1 Transmission Line Circuit Availability (total)
- Measure S2 Transformer Circuit Availability
- Measure S3 Loss Of Supply Frequency Index (>0.1)
- Measure S4 Loss Of Supply Frequency Index (>2.0)

S1- Circuit availability (transmission lines)

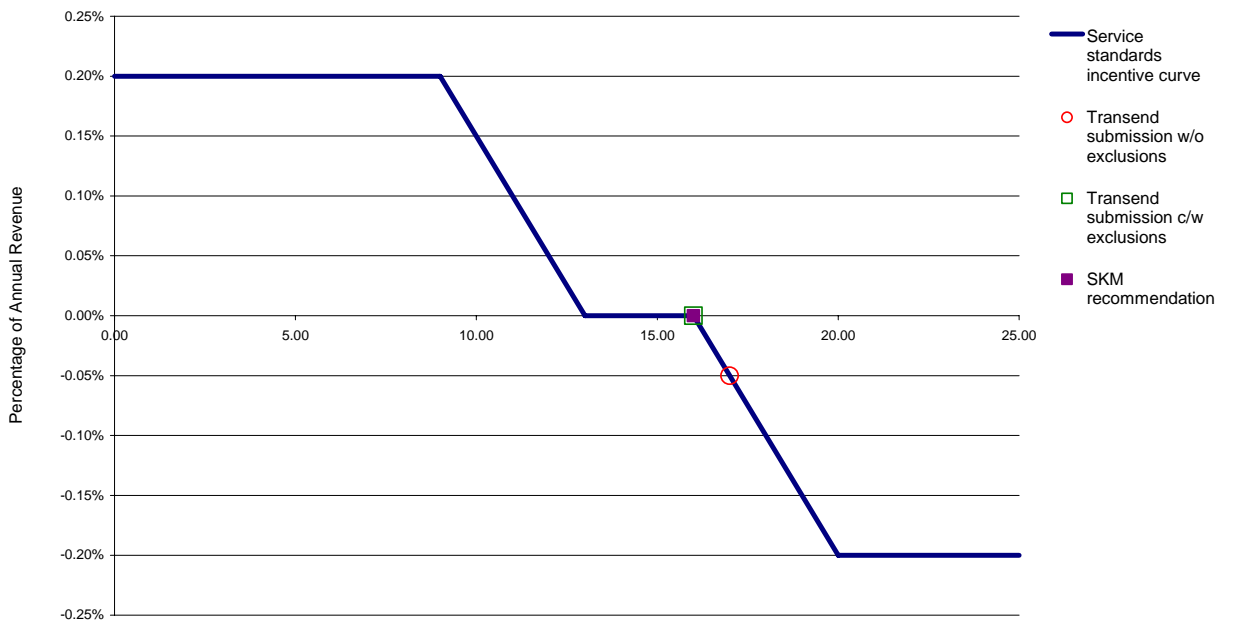




S2- Circuit availability (transformers)

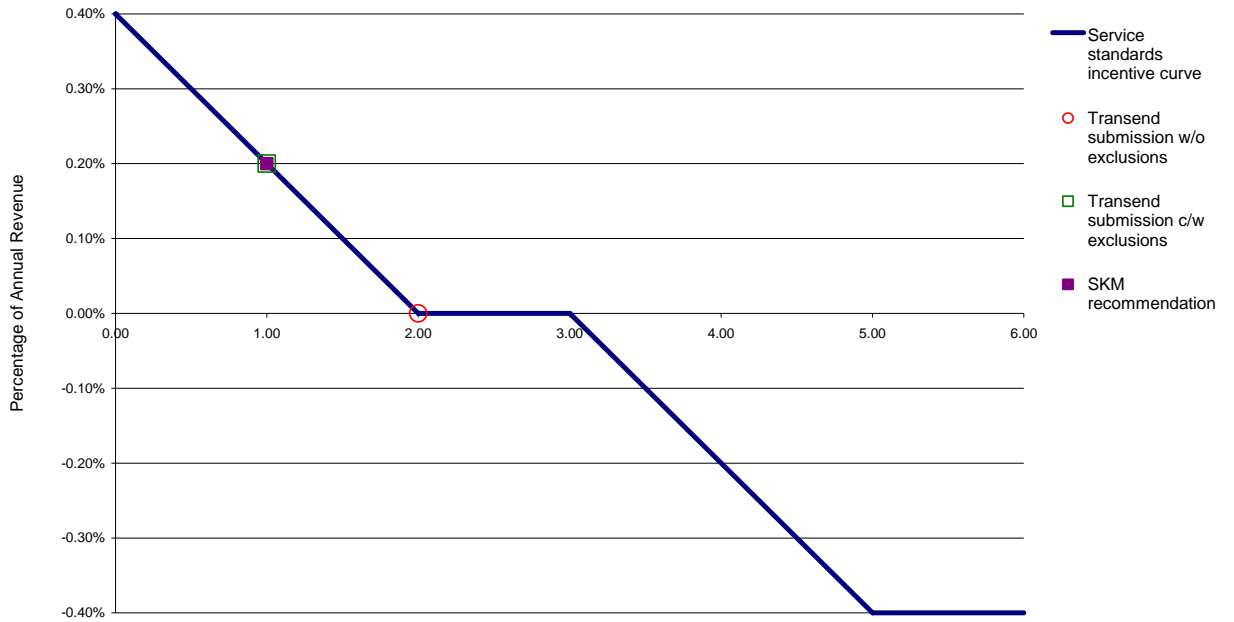


S3- Loss of supply frequency (>0.1 minute)





S4- Loss of supply frequency (>2.0 minute)





Appendix B Definition of Force Majeure

In the Transend Determination, the AER stated that “ ... *the force majeure definition from its [AER’s] service standards guidelines will be applied to Transend’s revenue cap. Transend is required to report all performance data, identifying any event that it considers should be excluded based on force majeure provisions. The [AER] will consider excluding events that are exceptional and isolated if they are covered by force Majeure provisions and service standards guidelines.*”¹²

The following is an extract from the AER Service Standards Guidelines¹³:

“For the purpose of applying the service standards performance-incentive scheme, ‘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.

¹² AER, *Tasmanian Transmission Network Revenue Cap: Decision*, 10 December 2003, section 8.4.3, pp 106

¹³ AER, *Statement of principles for the regulation of transmission revenues - Service standards guidelines*, 12 November 2003, Appendix E, Schedule 2



In determining what force majeure events should be 'Excluded force majeure events' the AER will consider the following:

- 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)?
- Could the TNSP have effectively reduced the impact of the event by adopting better practices?"