SINCLAIR KNIGHT MERZ
SKM

AUSTRALIAN ENERGY REGULATOR

Audit of Transend Service Standards Performance Reporting

PERFORMANCE RESULTS FOR 2005

- Final Report
- 29 March 2006

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Sinclair Knight Merz
ABN 37 001 024 095
369 Ann Street, Brisbane 4000
PO Box 246
Spring Hill QLD 4004 Australia
Tel: +61 7 3244 7100
Fax: +61 7 3244 7301
Web: www.skmconsulting.com

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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 2005 performance report of Transend based on the AER service standards established in the AER document "Decision – Tasmanian Transmission Network Revenue Cap 2004-2008/09".

The audit concentrated on a review of the performance results submitted by Transend, 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 events and/or other exclusions to ensure compliance with the revenue caps decision and AER service standards guidelines.

SKM met with Transend staff in Hobart on Monday 20th February 2006, to review their data, systems and the integrity of the system established by Transend for retrieving data from the PROMS[1] and Fault databases for reporting under the AER Service Standards Scheme. In addition, specific events were reviewed to examine any particular issues associated with the claim 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, except some SKM's findings on the application of exclusion events;
- Transend has correctly applied the AER performance incentive model that contain the S-factor equations and coefficients defined in the revenue cap decision to calculate the potential performance bonus / penalty amounts;
- the recording system used by Transend to capture the relevant details for outages is accurate and reliable;
- an audit of the interface between the PROMS and the Fault databases, and the performance reporting files found the transfer of data to be accurate and complete.

[1] Plant Restriction and Outage Management System

In evaluating Transend's application for exclusion of the specified events, SKM is of the view that:

- the upgrade of the wholesales metering to latest National Electricity Code compliance (as a prerequisite to entering the National Electricity Market) was consistent with the agreed definition of exclusion;
- the installation of NCSPS[2] is similar to other capital work carried out in the Transend network. In addition, good engineering practices were adopted by Transend to effectively reduce the impact on the transmission circuit availability due to installation of NCSPS;
- the measures taken by Transend were appropriate for mitigation against the risk of lightning that occurred on 28 January 2005 on the 220kV Gordon-Chapel St double circuits, which is designed for single contingency and that the occurrence of such an event is extraordinary;
- the incident of 3 February 2005 where a fallen tree caused outage of Norwood-Scottsdale-Derby 88kV transmission circuits be accepted as an exclusion under the provisions of Force Majeure; and
- the occurrence of multiple lightning strikes on 10 September 2005 that caused the concurrent loss three transmission line circuits, as well as the loss of the associated telecommunication circuits in an earlier strike can be considered as an exclusion under the provisions of Force Majeure.

SKM recommends that AER:

- accepts Transend's proposed exclusion on the installation of wholesale metering for latest National Electricity Code compliance;
- not accept Transend's proposed exclusion on the installation of the NCSPS for maximisation of Basslink power transfer;
- accepts Transend's proposed exclusion of the event on 28 January 2005 that caused a double circuit outage on the Gordon-Chapel St 220kV transmission line due to lightning;
- accepts Transend's proposed exclusion of the event on 3 February 2005 that caused an outage on the Norwood-Scottsdale-Derby 88kV transmission line due to trees falling;
- accepts Transend's proposed exclusion the event on 10 September 2005 that caused two single circuit outage on the Sheffield-Burnie 220kV and 110kV transmission circuits due to lightning;
- the S-factor calculated for Transend under the AER Service Standards Scheme for 2005 is 0.001875. The financial bonus applicable would be **0.1875% of the Annual Revenue for 2005** defined in the Transend revenue cap decision.

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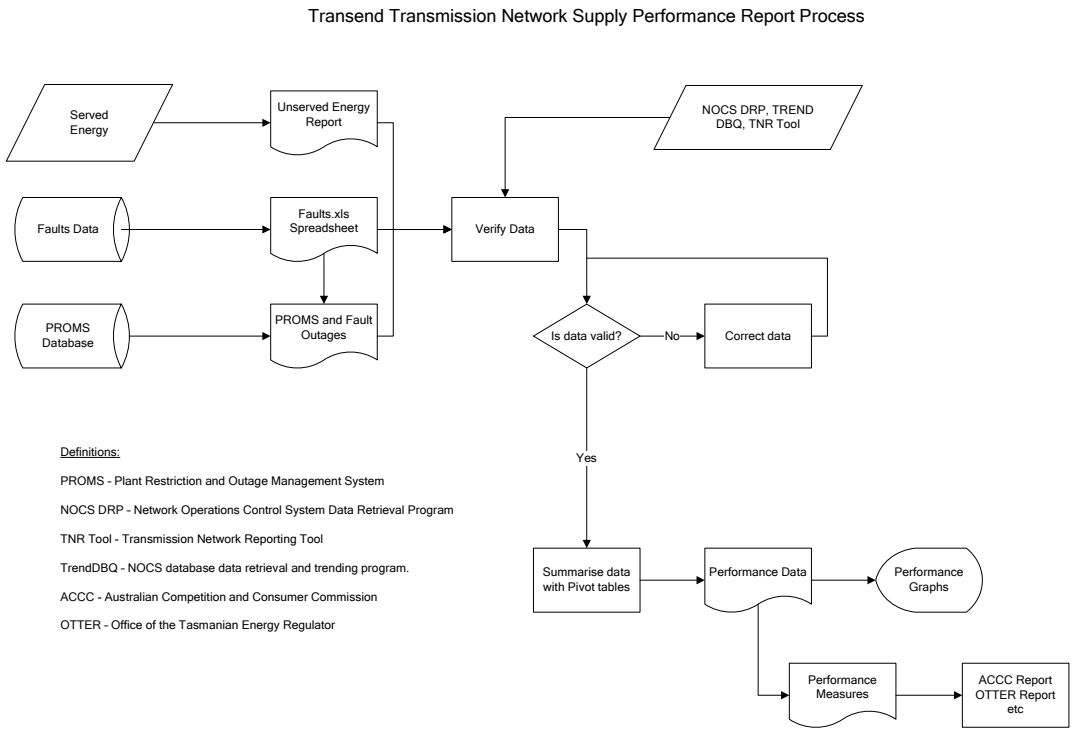
[2] Network Control System Protection Scheme

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 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 network performance reports. These procedures are contained in Transend document: Transmission Network Performance Report Procedure, TNM-GS-810-0285: Issue 3, February 2005”

2.1 Outage Details

For each planned or unplanned outage or operation on the network, 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 fault 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 network 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 network operations and activities. As both of these databases are maintained by the network operations group, who control, monitor and operate the transmission network 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 an Excel spreadsheet. 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 document[3] 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.

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[3] 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 software package ”Performance Watch” that analyses the raw data downloaded from the PROMS and fault databases and also analyses the events for performance qualifying events.

This routine looks at transmission lines for which the circuit breakers at each end of the line have been opened, and transformers that have no current flowing through them. These records are used as a check to ensure that as a minimum, each of these records has been assessed for inclusion in the performance statistics. SKM considered this a useful check mechanism for verifying the primary source of data.

All spreadsheets provided to SKM for the 12 month review period included the full details of the raw data ‘dump’ and subsequent sheets showed the culling and sorting results. The work group that undertakes the performance reporting are physically close to the network operators who operate and maintain the PROMS and fault databases. As such, there is good opportunity to verify all data and address any incomplete records.

2.5 Treatment of Capital Works

Through out the 2005 calendar year, Transend undertook various augmentations and capital works that resulted in some circuits being de-commissioned, and other new circuits added to the transmission network.

SKM audited the manner in which these deletions and additions to the network were addressed for the purpose of reporting network performance.

In each instance, SKM found that the network performance statistics for the month were calculated using the actual number of circuits commissioned and considered in service at the end of that month. The 12 month performance figures were then calculated by averaging the 12 individual month’s performance results.

2.5.1 SKM Review of Procedure

SKM has reviewed the treatment of retired and newly commissioned assets to the Transend network and agrees with the procedure adopted. By recognising both retired and newly commissioned assets in the month it retires from or enters into the network, Transend are ensuring the integrity of performance data.

2.6 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 (Appendix A) illustrating the S-factors proposed by Transend and recommended by SKM.

2.7 Recording System improvement

During the audit, SKM was advised that Transend is in the process of implementing an automated system that could dramatically reduce the amount of manual work associated with retrieving and processing the relevant records from the PROM and Fault database.

Transend indicated that the new system is planned for commissioning before next year's performance report.

2.8 AER Performance Excel spreadsheet

SKM randomly 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 the best available to Transend.

SKM also audited the determination of System Minutes and Loss of Supply Event Frequency Index (as appropriate) for a randomly selected number of outage events.

2.9 System Audit Findings

During 2005, there were 851 events that were subject to the AER Service Standards Scheme. More than 20 random checks on the recorded events were carried out for the audit. Each check involved selecting randomly the planned or unplanned outage/event initiated originally in PROMS database, and follows it through the process of data extraction to make sure that each record under reviewed is captured accurately in the final spreadsheet for the AER Service Standards reporting. All performance results gathered from the randomly checked records have shown good integrity of the process, including proper categorisation of events and the recording of the equipment off/on time. Therefore, SKM considered that the recording system was satisfactory, and the integrity of the recording system was sound. The arithmetic functions on the Excel spreadsheets were checked and found to have been correctly applied.

The allocation of exclusions appears to have been done in accordance with Transend's interpretation of the prescribed list of exclusions, as mentioned in section 2.3.

SKM is satisfied that the recording and data processing systems that have been put in place by Transend accurately log and calculate performance, subject to application and determination of those exclusions observed in this report, which may produce different performance results.

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.[4] 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 AER did not adopt this list of excluded events, noting that the AER considered that " ... *better outcomes will be reached by an annual review of exclusions. The AER requires Transend to report its raw performance data and its proposed exclusions separately*."[5]

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 Categorisation of 2005 events

Table 1 summarises the overall Transend 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	98.67%	(0.2500%)	98.63%	(0.2500%)
S2: Transformer Circuit availability - % Available	99.20%	0.0375%	99.20%	0.0375%
S3: Loss of Supply Frequency Index > 0.1 Minutes	13 Events	0.0000%	16 Events	0.0000%
S4: Loss of Supply Frequency Index > 2.0 Minutes	0 Events	0.4000%	3 Events	0.0000%
Total		**0.1875%**		**(0.2125%)**

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

[5] AER, *Tasmanian Transmission Network Revenue Cap: Decision*, section 8.4, pp 106

3.2 Event Based Exclusion Sought by Transend

In the submission to AER, there are five (5) events that Transend proposes to exclude from their performance measure calculations. These events are:

- The installation of the wholesale energy market metering for Tasmania to enter the National Electricity Market in 2005.
- The installation of Network Control System Protection Scheme (NCSPS) to manage high loading in Transend assets and to enable NEMMCO to meet the power system security obligations during maximum Basslink transfers.
- Loss of supply events that occurred on:
  - 28 January 2005, a double circuit outage on the Gordon-Chapel St 220kV transmission line due to lightning.
  - 3 February 2005, outage of Norwood-Scottsdale-Derby 88kV transmission circuit due to a tree falling on the transmission line during a storm
  - 10 September 2005, a triple circuit outage on the Sheffield-Burnie 220kV and 110kV transmission line circuits due to lightning.

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.

3.3 Wholesale Energy Market Metering

The installation of the wholesale energy market metering was necessary as a pre-requisite for Tasmania to enter the National Electricity Market in 2005. Transend, as a TNSP, has no control over the requirements of the project, nor its implementation, timing and methodology. The project was non-negotiable and driven by the requirement for compliant metering.

Transend have claimed an exemption for outages associated with the installation of wholesale energy market metering on the basis that:

- The project was extraordinary;
- It was a one off project;
- Transend could not have prevented the impact of the project; and
- Transend could not have effectively reduced the impact of the project by adopting better practices.

3.3.1 Audit Findings

SKM acknowledges Transend's contention that the intention of the service standards scheme was not to include 'third party' events outside the control of the TNSP. However, SKM is of the view

that not all 3rd party events outside the control of TNSP should be accepted as the basis of exclusion.

Transend defined the installation of wholesale energy market metering as an excluded event in its Revenue Cap Application for the period 1 January 2004 to 30 June 2009. The impact of the Wholesale Metering Project on circuit availability performance was accepted as an exclusion in 2004[6].

3.3.2 Recommendation

SKM acknowledges and supports Transend's contention that the intention of the service standards scheme was not to include events beyond the reasonable control of the TNSP affected by such event. SKM recommends that all outages associated with the installation of wholesale energy market metering be excluded for the determination of Transend's performance in accordance with the AER's Service Standards Scheme.

3.4 Network Control System Protection Scheme (NCSPS)

Transend undertook the Network Control System Protection Scheme (NCSPS) project in 2005 in preparation for Basslink and entering the National Electricity Market. Basslink is anticipated to have an export transfer capability of 630 MW from Tasmania and an import transfer capacity of 480 MW into Tasmania. This load flow represents a substantial increment to the Tasmanian power system and introduces new requirements to manage high loadings on Transend's assets and to enable NEMMCO to meet power system security obligations under the National Electricity Rules (NER). To meet these challenges, installation of the NCSPS was a NEMMCO prerequisite for Basslink commissioning. The NCSPS will take pre-determined actions to ensure system stability following either the loss of Basslink or one of Transend's transmission circuits that are critical to Basslink transfers. The installation of NCSPS had an impact on circuit availability.

Transend have claimed an exemption for outages associated with the installation of NCSPS on the basis that:

- The project was extraordinary;
- It was a one off project;
- Transend could not have prevented the impact of the project; and
- Transend could not have effectively reduced the impact of the project by adopting better practices.

[6] refer to ACCC's letter of 28 April 2005- Application of the performance incentive scheme for 2004

3.4.1 Audit Findings

SKM found that most works associated with the installation of NCSPS were carried out without supply interruption using advanced live line techniques. Therefore, it is considered that Transend adopted good practices to effectively reduce the impact of the project. The impact on the transmission circuit availability measure due to installation of NCSPS is minor (approximately 0.01%).

SKM acknowledges that the capital work associated with the NCSPS Scheme is not part of the regulated capital allowance for Transend determined by the AER, and is required as a NEMMCO pre-requisite for the commissioning of Basslink.

3.4.2 Recommendations

The excluded events defined in the performance measures in the Tasmanian revenue cap[7] exclude the impact of unregulated transmission assets on transmission circuit availability and loss of supply measures. SKM is of the view that these particular excluded events defined in the performance measures in the AER decision relate to the operation and/or failure of unregulated assets upon the transmission network, rather than their installation.

Whilst the capital work is not part of the Transend regulated capital work allowance, the installation of the NCSPS equipment on the transmission network is being conducted by Transend, with any outages required for this work within Transend's control. SKM considers that this is reflected by the good engineering practices using advanced live line techniques that have been adopted to minimise these outages.

Therefore, SKM considers the installation of NCSPS to be similar to other capital work carried out in the network and recommends that the outage associated with the installation of NCSPS should not be excluded from the performance results. However, to be consistent with the performance calculations for other TNSPs, SKM would recommend that the effect of this capital work event in performance calculations is capped to an aggregate duration of 14 days.

3.5 Loss of Supply Events

SKM was advised that three loss of supply incidents were investigated thoroughly using Transend's internal investigation process that follows the Systematic Cause Analysis Technique (SCAT). The investigations identified some opportunities for improvement, including changes to operating practices and/or future capital expenditure considerations. However, even with such improvements introduced, Transend recognised that each of these events would have had a significant loss of supply impact.

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[7] AER, *Tasmanian Transmission Network Revenue Cap: Decision*, Appendix G, pp 128

3.5.1 Gordon-Chapel St 220kV double circuit outage

On 28 January 2005, a double circuit outage occurred on the Gordon-Chapel St 220 kV transmission line due to lightning. The incident caused a loss of generation from Gordon Power Station and resulted in operation of under frequency load shedding (UFLS) schemes with a total loss of supply of 4.19 system minutes. A description of the outage and the reasons for exclusion is available as Transend Incident Report IR-113.

3.5.1.1 Audit Findings

Transend has excluded the performance impact of this incident from the AER Performance Incentive Scheme for the following reasons as outlined in their performance report:

- *The lightning storm caused the concurrent loss of both transmission line circuits connecting Gordon Substation. The Gordon Substation has n-1 redundancy and was not designed to withstand a double circuit outage.*
- *There is nothing that could have been done to lessen the impact of the event. Supply was restored as fast as was practicable in the circumstances.*
- *The impact could not have been prevented. The two Gordon-Chapel St 220 kV transmission line circuits involved are the only means of connecting Gordon Power Station.*

Transend provided additional documentation to support their assertions.

SKM acknowledges that the Gordon-Chapel St 220kV transmission circuits are designed for single contingency and not to withstand a double circuit outage.

As this is the first double circuits outage caused by lightning that SKM has audited and considered under the AER Service Standards Scheme, SKM feels that it is important to propose a treatment of such double circuit outage since the security standards of various transmission companies may differ, in terms of their planning criteria and system configuration to deal with such an outage. Where two transmission circuits are connected to a power station or supplying a large and critical load, some transmission companies may avoid applying the n-1 philosophy where the circuits are on a single tower, on the same easement corridor or buried in the same cable trench (in the case of cable).

The design of the modern transmission circuits, together with appropriate protection measures, are such that the frequency of double circuit outage due to lightning is extremely low. This rare occasion, when they do occur, can be considered as a force majeure event. As a general rule, SKM would recommend that for the purpose of AER Service Standards Scheme, a double circuit outage be treated as follows:

- For the purpose of calculating the circuit availability, the outage of the first circuit be included in the performance measures and the outage of the second circuit be excluded from the performance measures (i.e. the 2nd outage should be treated as a separate event and be considered as force majeure).
- For the purpose of calculating the loss of supply index, a double circuit outage be excluded from the performance measures on the basis that it is a force majeure event.

3.5.1.2 Recommendations

SKM considered that the measures taken by Transend were appropriate for mitigation against the risk of lightning strike on the 220kV Gordon-Chapel St double circuits, which is designed for single contingency and agreed that the occurrence of such event is extraordinary. Hence, SKM recommends that this event be considered as an exclusion.

3.5.2 Norwood-Scottsdale-Derby 88kV transmission circuit outage

During a severe storm on 3 February 2005, an outage occurred on the 88kV Norwood - Scottsdale - Derby transmission circuit. Three trees fell in a domino effect resulting in the third tree, approximately 42 metres in height, contacting a transmission tower. The incident caused damage to the tower and breakage of two conductors, resulting in a total loss of supply of 3.65 system minutes.

Significant work was required to clear the site of fallen vegetation before repair work could begin. Severe weather conditions hampered these repair efforts, with trees continuing to fall near the site of the incident. Supply was restored to the Scottsdale and derby substations on 3 February 2005, with the tower repairs completed on the following day.

3.5.2.1 Audit Findings

Between 2 and 5 February 2005, an exceptional meteorological situation brought widespread storms, large hail, hurricane-force winds, torrential rainfall, flooding, duststorms, unseasonable snow and intense heat and cold to the eastern states and Tasmania.[8]

In Tasmania, the Bureau of Meteorology reported " *... severe south to southeast winds ... in the northeast of Tasmania in the early hours of the 3rd ... with many homes badly damaged partially due to the large numbers of fallen trees*."[9]

The total damage bill for Tasmania was estimated to be approximately $5M.

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[8] Australian Weather News, 2 to 5 February 2005

[9] Bureau of Meterology significant weather report for 2/3 February 2005, www.bom.gov,.au

During the audit, SKM found that there are sidefall vegetation issues in many parts of the Transend network, covering an extensive area. Although Transend easement management practices include a tall tree hazard reduction program, there remains a significant number of 'off-easement' trees that present an issue to the nearby transmission towers. In some areas, the height of such 'off-easement' trees can be as tall as 80m.

Transend has developed a vegetation management program for the transmission line easements in accordance with its own Environmental Management System (EMS) and the specific statutory requirements of the following Tasmanian and federal statutory Acts:

- Environmental Management and Pollution Control Act 1994;
- Threatened Species Protection Act 1994;
- National Parks and Reserves Management Act 2002[10];
- Forest Practices Act 1985; and
- Weeds Management Act 1999.

This vegetation management program includes:

- Routine inspection of the easements and identification of potential issues;
- Vegetation clearing and herbicide treatment to control regrowth; and
- Random audits of contractor's work to ensure compliance with Transend requirements.

Easement widths typically range between 50 and 60 metres, with the 88kV Norwood - Scottsdale - Derby transmission circuit easement being approximately 50 metres.

3.5.2.2 Recommendations

SKM notes that Transend has no legal authority to maintain the off-easement vegetation, and is required to negotiate with individual land owners to trim or remove any individual trees that may be considered to represent a potential risk of falling towards and / or onto the transmission line.

In Table 10.1 of the Transend Easement Management Plan, risk assessment considers " ... *sidefall trees capable of contacting conductor or structure, which are subject to risk ie. condition of tree* [or] *probability of falling.*"

Any assessment of the probability of a tree falling onto the transmission line is based on the following issues:

[10] This supercedes the previous National Parks and Wildlife Act 1970

- Poor tree condition due to bushfire damage or decay;
- Poor ground conditions resulting in unstable roots; and
- Lean towards the transmission line.

Whilst there was a domino effect, SKM notes that the tree that finally made contact with the transmission tower was a healthy tree that would not have normally been assessed for probability of falling onto the transmission line.

SKM is of the view that Transend only has legal authority over the easement itself, and limited ability to control the height of off-easement trees, particularly healthy trees. SKM recognises that the Transend EMS has been certified to international environmental standards, and the vegetation management program is in accordance with good industry practice.

SKM considers that this event satisfies the provisions of the Force Majeure definition as being an extreme event which was beyond the control of Transend, despite their observance of good industry practice, and recommends that it be accepted as an exclusion.

3.5.3 Sheffield-Burnie 220kV and 110kV transmission circuit outage

On 10 September 2005, a double circuit outage occurred on the Sheffield-Burnie 220kV and 110kV transmission line circuits due to lightning. The incident was exacerbated by a concurrent outage of the Ulverstone-Emu Bay 110kV transmission circuit and the failure of associated telecommunication services due to lightning. The incident caused a loss of supply to a number of North West substations of 4.08 system minutes. A description of the incident and the reasons for exclusion is available as Transend Incident Report IR-163.

3.5.3.1 Audit Findings

When the lightning detection system identified lightning activity in the Burnie area, Transend operators, in accordance with operating procedures, enabled all available auto reclose facilities on all the transmission circuits in the threatened area. SKM considers this was a prudent operational practice. In addition, NEMMCO were advised that Transend considered the potential loss of a double circuit transmission line to be a credible contingency.

In its incident report (IR-163), Transend states *"At approximately 12:21 hours lightning struck the Round Hill telecommunications node, resulting in the failure of Burnie, Emu Bay, Hampshire, Port Latta and Smithton remote terminal unit (RTU) circuits, as well as the Sheffield-Burnie transmission circuit protection communications. "* and *"…..At 12:35 hours lightning stuck both the Sheffield-Burnie No 1 220kV and the Sheffield-Burnie No 2 110kV transmission circuits resulting in sustained interruption on both circuits…"*

SKM considers that the Ulverstone-Emu Bay circuit trip, protection telecommunications out of service, RTU and all SCADA communication services out of service for most of the region and simultaneous tripping of the two Sheffield-Burnie circuits was an extremely rare event. The three separate coincidental strikes in the lightning storm that caused the concurrent loss of these three transmission line circuits, as well as the loss of associated telecommunication circuits in an earlier strike was, in the view of SKM, an extraordinary event.

Although the failure of the RTU and the Sheffield-Burnie transmission circuit protection communication is not the main cause of permanent outage on the 220kV and 110kV Sheffield-Burnie circuits, it did impact the restoration of the circuit due to the outage of protection signalling and the RTU. SKM acknowledges that Transend restored supply as quickly as practicable in the difficult circumstances.

There is no earth wire installed along the bulk of the transmission corridor between Sheffield and Burnie. SKM notes that only approximately 36% of transmission line route length in Tasmania has overhead earth wires installed, which is, according to SKM's experience, not uncommon for a small power system such as Tasmania.

The lightning strike has resulted in the failure of insulator strings, which was likely to be the main cause of the permanent fault on the 110kV and 220kV transmission lines between Sheffield and Burnie. Even though there were auto-reclose facilities on the Sheffield – Burnie No.1 220kV circuit, these could not be used at the Burnie end to minimise the impact on the circuit availability.

3.5.3.2 Recommendations

SKM considers that the occurrence of multiple lightning strikes that caused the concurrent loss of three transmission line circuits, as well as the loss of the associated telecommunication circuits in an earlier strike is extraordinary, on this basis, may be qualified as a force majeure event.

SKM recommends that this event be excluded from the performance results.

4. Force Majeure

In the Transend revenue cap decision, the AER stated that the Force Majeure definition that will apply is that stated in the AER Service Standard Guidelines.

The following is an extract from the AER Guidelines, dated 12 November 2003:

"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.

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?"

5. Calculation of S-Factors

Table 3 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.

- **Table 2 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%	98.63%	98.67%	98.63%	98.66%
2	S2 - Transformer Circuit Availability	99.00%	99.20%	99.20%	99.20%	99.20%
3	S3 - Loss of Supply Frequency Index (>0.1)	16	16	13	16	13
4	S4 - Loss of Supply Frequency Index (>2.0)	3	3	0	3	0

- **Table 3 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%)	(0.2500%)	(0.2500%)	(0.2500%)
2	S2 - Transformer Circuit Availability	0.0375%	0.0375%	0.0375%	0.0375%
3	S3 - Loss of Supply Frequency Index (>0.1)	0.0000%	0.0000%	0.0000%	0.0000%
4	S4 - Loss of Supply Frequency Index (>2.0)	0.0000%	0.4000%	0.0000%	0.4000%
	TOTAL	**(0.2125%)**	**0.1875%**	**(0.2125%)**	**0.1875%**

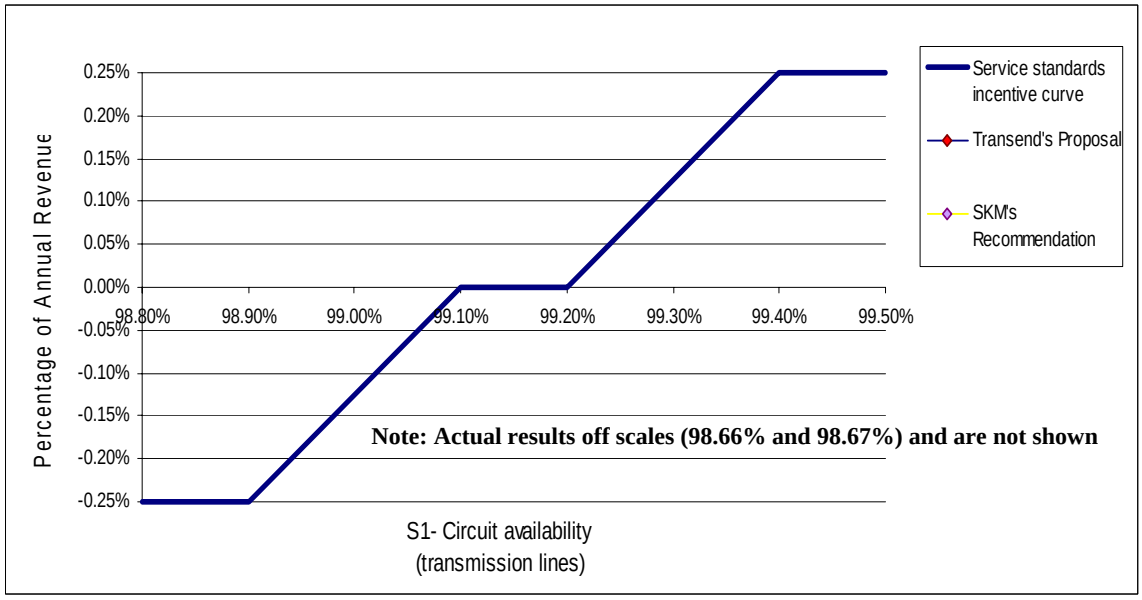
The profiles for each of the applicable measures are shown in Appendix A to illustrate the performance in graphical terms. Based on these results, SKM recommends the bonus for Transend should be **0.1875% of the agreed Annual Revenue for 2005.**

Appendix A Performance Measure Profiles

The Performance Measure profiles graphically illustrate the 2005 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)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0.10%
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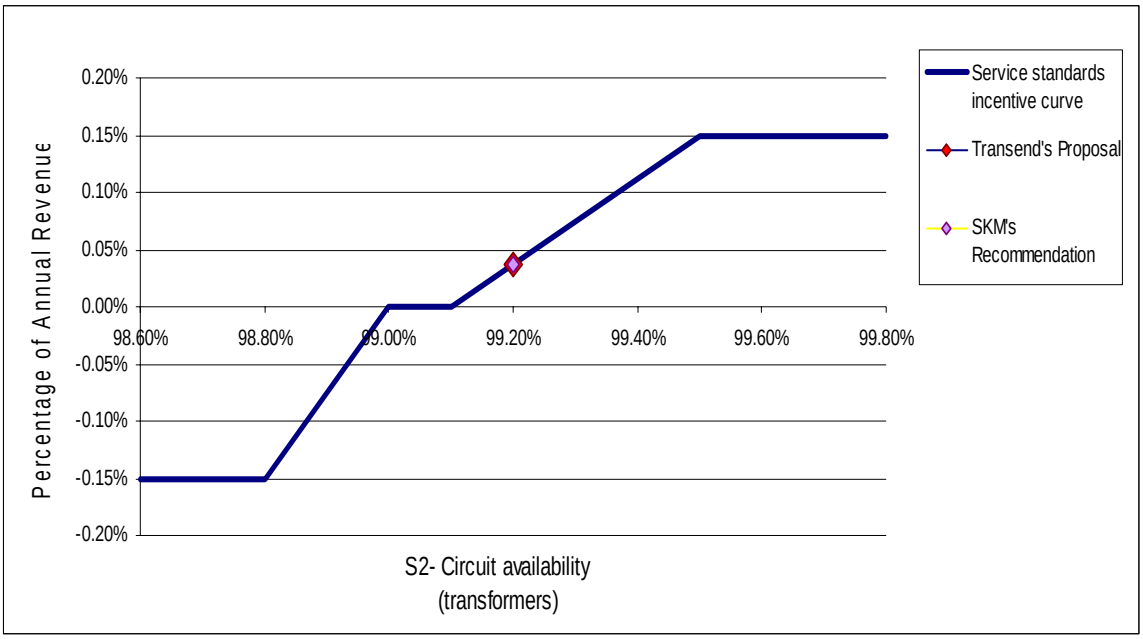
0.00%
-0.05%
-0.10%
-0.15%
-0.20%
-0.25%
98.80%
98.90%
99.00%
99.10%
99.20%
99.30%
99.40%
99.50%
Percentage of Annual Revenue
Service standards incentive curve
Transend's Proposal
SKM's Recommendation
Note: Actual results off scales (98.66% and 98.67%) and are not shown
S1- Circuit availability (transmission lines)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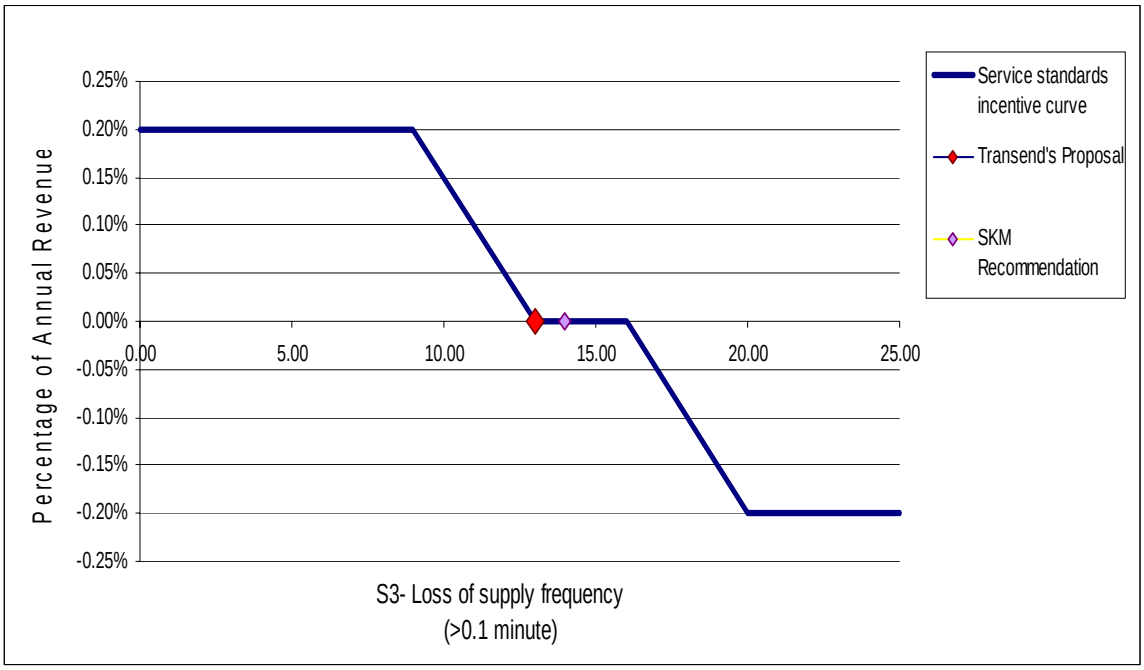
99.00%
99.20%
99.40%
99.60%
99.80%
Percentage of Annual Revenue
Service standards incentive curve
Transend's Proposal
SKM's Recommendation
S2- Circuit availability (transformers)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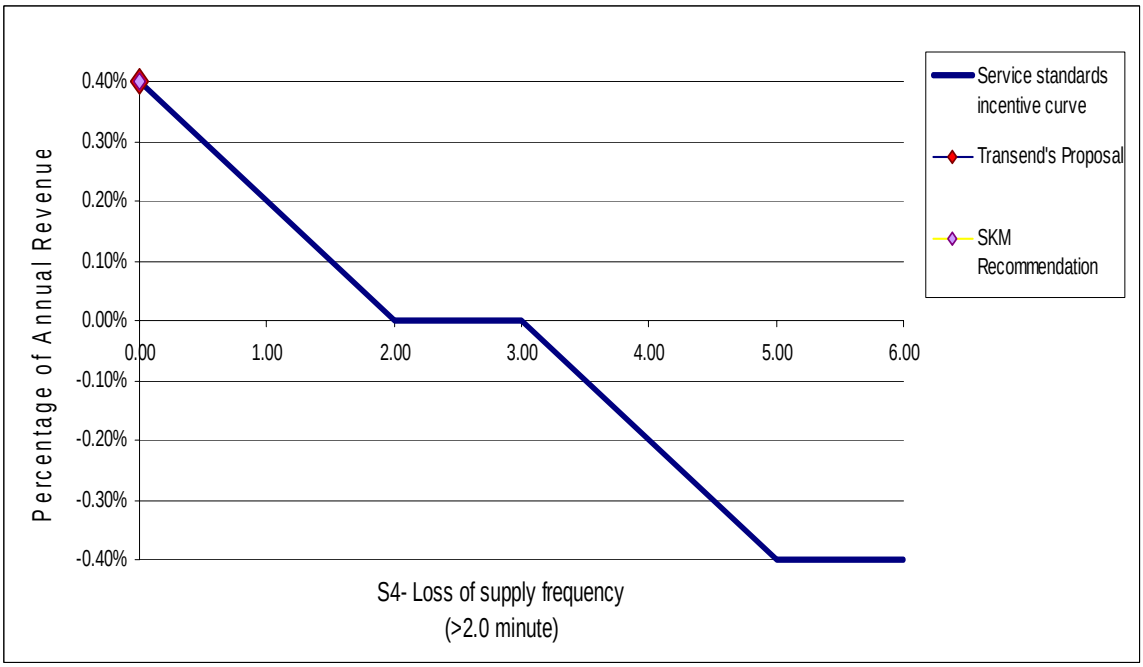
25.00
Percentage of Annual Revenue
Service standards incentive curve
Transend's Proposal
SKM Recommendation
S3- Loss of supply frequency
(>0.1 minute)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1.00
2.00
3.00
4.00
5.00
6.00
Percentage of Annual Revenue
Service standards incentive curve
Transend's Proposal
SKM Recommendation
S4- Loss of supply frequency
(>2.0 minute)