Review of AER Service Standard Performance Incentive Scheme

STAGE 1 - STANDARD MEASURES & DEFINITIONS

- Final (version 1.4)
- 25 September 2007

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1. Executive Summary

Sinclair Knight Merz (SKM) was engaged by Transend Networks to undertake a review of the current suite of service standards performance measures within the Australian Energy Regulator's (AER), Service Target Performance Incentive Scheme (STPIS). The initial phase of this review concentrates on the structure of the STPIS Scheme, focusing on the selection of performance measures proposed to be used during the next regulatory period 1st July 2009 – 30th June 2014.

SKM understands that Transend has an opportunity to propose amendments to the AER Performance Incentive (PI) Scheme's performance measures. This review examines the parameters within the existing scheme, and proposes retention of, or changes to, parameters in line with the provisions of the AER's Final Decision, as held within the document entitled "Electricity Transmission Network Service Providers Service Target Performance Incentive Scheme" (STPIS) of August 2007.

The overall findings and conclusions of this review, and SKM's recommended scheme, are as follows:

- Circuit Availability

  Amend the existing transmission line circuit measure to focus separately on those circuits with direct NEMMCO oversight (excluding radials), and indirect NEMMCO oversight; that is, to replace the existing total transmission system availability measure with an instrument that facilitates greater alignment with measures of the availability of critical and non-critical circuits, as per the objectives of the STPIS. Excluded from these new measures are any transmission circuits subject to a separate connection agreement;

  Retain the existing transformer availability measure.

  SKM considered that further division of any Circuit Availability measures into peak and off-peak periods, as described in the STPIS, was not found to be beneficial in the case of Transend;

- Loss of Supply (LOS)

  Retain the LOS index with a threshold of 0.1 system minute, but amend the LOS index for the longer events from 2 system minutes to 1 system minute. SKM considers that this change reflects both the improvements that Transend has made over the past 5 years in transmission system performance, and provides better incentives for future improvements;

- Average Outage Duration

  SKM has reviewed the available data for measuring the average outage duration of transmission assets. This measure was previously excluded from the suite of performance measures used in the PI Scheme, and SKM considers that this measure remains unnecessary;

- Inter / Intra Regional Constraints

  A recently released Issues Paper[1] regarding potential market measures appears to offer one measure relating to planning of outages that may be consistent with some of the internal drivers for improvement within Transend, but the issue of market impact measures will require further discussion and analysis after the release of the final decision by AER later in 2007.

[1] AER, *Service Target Performance Incentive Scheme: Developing incentives based on the Market Impact of Transmission Congestion – Issues Paper*, June 2007

2. Scope

All Transmission Network Service Providers (TNSPs) in the Australian National Electricity Market are or will be subject to the provisions of a STPIS scheme. The scheme is based on a uniform framework that has flexibility to customise the service standards to suit individual transmission system circumstances and take into account the TNSP's existing recording systems.

The details of the relevant measures, including definitions, target levels, relative weightings and S-factor formulae are included in the AER determination for each TNSP. For Transend, the current determination[2] established four (4) performance measures as the basis for S-factor calculation:

- Transmission line circuit availability;
- Transformer circuit availability;
- Loss of Supply Event Frequency Index - number of events > 0.1 system minutes; and
- Loss of Supply Event Frequency Index - number of events > 2.0 system minutes.

SKM was engaged to undertake a review of the existing and proposed performance measures, and with consideration of the following:

- Document the statistical methodology and approach used to analyse Transend's current and potential measures;
- Review any effects the existing measures may have had on Transend's performance;
- Examine any effect Basslink is having on the transmission system performance;
- Develop options for changes to the current scheme and review those with Transend;
- Analyse past and forecast future performance of the proposed measures;
- Document the outcomes anticipated from the proposed changes to the scheme.

The initial phase of this review concentrates on the structure of the Transend PI Scheme, focusing on the selection of performance measures proposed to be used during the next regulatory period of 1st July 2009 – 30th June 2014.

[2] ACCC, *Tasmanian Transmission Network Revenue Cap 2004 to 2008-09: Decision*, 10 December 2003. This determination was released prior to Tasmania joining the National Electricity Market (NEM) on 29 May 2005.

3. Performance Measure Structure

In evaluating potential performance measures for Transend for its next regulatory determination, it is necessary to ensure compliance with the established framework for the AER service standards regime.

3.1 Framework

The general principles governing the regulation of TNSP revenue are defined in Chapter 6 of the National Electricity Rules (the Rules). In particular, clause 6.2 and related sub-clauses detail the national regulatory arrangements, objectives, principles for regulation, form and mechanism of economic regulation and information reporting requirements.

The Rules are non-prescriptive about the performance standards to be imposed, but require any service standards to "*… provide Transmission Network Service Providers with incentives and reasonable opportunities to increase efficiency*."[3]

The framework for the AER PI Scheme is based on a set of general principles for service performance measurement, together with some high level considerations from the AER based on the requirements of the Rules.

3.2 High Level Principles

In evaluating the suitability of performance measures for the service standards regime, nine (9) general principles were established by the Australian TNSPs during the original discussion phase with the then ACCC (now AER). These principles were used in developing the original suite of measures for each TNSP, and should be considered in developing the next set of measures for Transend.

Principle 1 Sound accountability regime

This principle required that a TNSP should only be accountable for outcomes that it can control, or which it is best placed to manage. For example, although a TNSP cannot directly control the impacts of weather or lightning strikes, it is in the best position to assess the likely impacts of these elements on its transmission system and to take the necessary design decisions, and operational actions to minimise the impacts.

[3] *National Electricity Rules*, July 2005, chapter 6, clause 6.2.3 (d)(1)

Principle 2 Recognition of individual TNSP accountabilities and limits

Performance measures must reflect structural differences between jurisdictions and relative "powers to act" such as planning powers.

Principle 3 Commensurate rewards for new risks and costs

Performance measures, standards and incentives must only be applied once there has been explicit consideration of the cost and risk impacts on revenue caps.

Principle 4 Emphasis should be on providing positive incentives

Performance incentives must be positive and not punitive. The Rules identify that the regulatory regime to apply to TNSPs is to be incentive based. The TNSPs believed that this concept aimed to encourage TNSPs to be innovative in their business operations to improve performance and reduce costs that will ultimately provide economic benefit to the market as a whole. Accordingly, financial performance incentives in the service standards regime should provide positive incentives by allowing the TNSP to earn additional revenue over and above the revenue caps.

Principle 5 Statistical soundness

Performance measures must be statistically sound. Many network performance measures exhibit a statistical distribution that is not consistent with using the mean or median values as a simple target for a single year. For these measures, statistical approaches applicable to small populations and rare events must be applied to identify appropriate norms and acceptable variances.

While it is recognised that there is an element of variability of any measure that may be adopted, this variability should not be so great as to overshadow the underlying level of performance being delivered by the TNSP.

Principle 6 Auditable measures

Any performance parameter should be relatively easy to measure, and be relatively easy to "check measure". However, simplicity should not be given preference over the fundamental issues.

Principle 7 Alignment with desired outcomes

The performance targets should be carefully aligned with the desired outcomes. This requires the definition of desired outcomes as a first step.

Principle 8 Key measures

Measures must be significant in achieving desired outcomes, and preferably be few in number. This principle imposed disciplined consideration of the relative importance of each measure to achieving desired outcomes to ensure maximum effectiveness.

Principle 9 Legal context

Service standards must mesh coherently with other legal and regulatory requirements applying to TNSPs and the AER.

3.3 AER Service Standard Guidelines

Included in the AER's August 2005 "*Compendium of Electricity Regulatory Guidelines*", is a document entitled "*Transmission Network Service Standards*", subsequently referred to as the "*Service Standard Guidelines*" (the Guidelines). These guidelines were established for the implementation of service standards to:

- Explain its approach to setting performance incentives within the revenue cap; and
- Outline the information required to implement these service standards.

The intended application of these Guidelines is defined as:

"*These guidelines will:*

1.1 be used by the AER to decide the service standards component of transmission revenue cap decisions as required by the

NER

1.2 provide guidance about the approach the AER will take in setting performance-incentives within each transmission revenue cap decision

1.3 provide guidance to TNSPs about the service quality information to provide in its revenue cap application

1.4 provide TNSPs with guidance about the information it should give the AER annually, to indicate its compliance with the incentive component of the transmission revenue cap decision."[4]

Whilst TNSPs can maximise their profits within their revenue cap by reducing costs below forecast levels, the AER introduced the service standards regime to avoid these cost reductions resulting in reduced service quality. The Guidelines explain the development and implementation of a performance incentive scheme based on a standard set of measures, each with a level of flexibility in definitions to accommodate the different data collection and reporting systems, and state regulatory reporting requirements used by the TNSPs.

[4] AER *"Compendium of Electricity Regulatory Guidelines"* ,August 2005, Transmission Network Service Standards, section 1 , pp 42

3.4 Service Target Performance Incentive Scheme

In August 2007, the AER released a document entitled "*Electricity Transmission Network Service Providers Service Target Performance Incentive Scheme"*, which, consistent with the requirements of clause 6A.7.4 of the National Electricity Rules (NER), set out the AER's Final Decision with regards to the framework of their Service Target Performance Incentive Scheme (STPIS). The AER's STPIS prescribes the parameters, being the suite of measures each Transmission Network Service Provider's (TNSP) performance is gauged against, and the amount of revenue at risk for achieving, to varying degrees, or not achieving the set targets within these parameters. The role and objectives of the STPIS are:

"1.3 Role of this scheme

(a) This scheme:

(1) defines the performance incentive scheme parameters which specify how a transmission network service provider's (TNSP) network reliability is measured

(2) sets out the requirements with which the values to be attributed to the parameters must comply

(3) will be used by the AER to decide the service standards financial reward or penalty component of a transmission determination

(4) provides guidance about the approach the AER will take in reviewing a TNSP's service standards performance and explain how this will affect a TNSP's maximum allowed revenue.

(b) The obligation of a TNSP to comply with this scheme:

(1) is additional to any obligation imposed under any other law applying to a TNSP, and

(2) does not derogate from such an obligation.

1.4 AER's objectives

The AER's objectives for this scheme are that they:

(a) Contribute to the achievement of the national electricity market objective

(b) Are consistent with the principles in clause 6A.7.4(b) of the NER

(c) Promote transparency in:

(1) the information provided by a TNSP to the AER and

(2) the decisions made by the AER.

(d) Assists in the setting of efficient capital and operating expenditure allowances in its transmission determinations by balancing the incentive to reduce actual expenditure with the need to maintain and improve reliability for customers."[5]

[5] AER, *Final Decision – Electricity Transmission Network Service Providers - Service Target Performance Incentive Scheme*, August 2007, section 1, pp 1

4. Existing Performance Incentive Scheme

Within it current regulatory period, 2004 – 2008/9, Transend's performance, in terms of service standards, is evaluated according to the then ACCC's Performance Incentive Scheme described in the *Tasmanian Transmission Network Revenue Cap 2004 to 2008-09: Decision*, of 10 December 2003.

The existing Performance Incentive (PI) Scheme for Transend is based on four (4) measures:

- Transmission line circuit availability;
- Transformer availability;
- Loss of Supply Event Frequency Index - number of events > 0.1 system minutes; and
- Loss of Supply Event Frequency Index - number of events > 2.0 system minutes.

These measures were chosen because:

- Circuit availability was considered to be of particular interest to the wholesale generation market, with increasing importance after the Tasmanian market entry into the NEM; and
- Losses of supply measures are important to end users and retailers.

4.1 Current AER Determination

In the current determination, the then ACCC noted several issues raised by interested parties with regards to possible additional measures.

4.1.1 Average Outage Duration

The purpose of this measure is to provide incentives for a TNSP to minimise the time required to restore the Transmission System to its normal state following an unplanned outage.

In their July 2002 "TNSP Service Standards: Transend Report", submitted to the ACCC (TNM-SR-809-0020), Transend discussed apprehensions regarding the clarity within the definition provided for this specific measure. The definition, as proposed, brought about concerns regarding the measure's ability to be applied to its intent, which, in turn, was thought to affect the level of potential distortions within a TNSP's overall annual performance figures. Transend suggested that under the definition of Average Outage Duration put forward by the ACCC, " … *that a small*

number of significant outages distort the measure". [6] Transend also reported that the data available for input into this specific measurement was considered to carry a low level of confidence.

This argument was accepted by the then ACCC, although Transend was requested to report against this measure over the course of the regulatory period 2004 - 2008/09, with a view or considering its possible inclusion in the following revenue cap.

4.1.2 Connection Point Performance

Some submissions to the draft decision for the current determination requested the ability to negotiate higher (or lower) levels of service at their connection points for increased (or decreased) connection charges.

The ACCC noted that " … *TNSPs in the NEM already do this and that such negotiations are best left to the TNSP and its customers. Where the customer is paying for a higher level of service, Transend should not receive a financial reward through the PI scheme. Conversely, when a customer receives a discount for a lower level of service, Transend should not be penalised.*"[7] This view has been reiterated within the STPIS.

4.1.3 Intra-regional Constraints

Consideration of an intra-regional constraint measure was deferred to future revenue cap decisions, as the ACCC did not have sufficient information to set appropriate targets. However, the Commission did suggest that it considered " … *that Transend should already have a system to analyse intra-regional constraints for network operation and planning purposes.*"[8]

4.2 OTTER[9] Reporting Requirements

In February 2007, OTTER published the Electricity Supply Industry Performance and Information Reporting Guideline which provides for the collection, analysis and reporting of non-financial performance information by a licensee in the Tasmanian electricity market. This guideline will take effect from 1 July 2007.

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[6] ACCC, *Tasmanian Transmission Network Revenue Cap 2004 to 2008-09: Decision*, 10 December 2003, section 8.4.3, pp 105

[7] ACCC, *Tasmanian Transmission Network Revenue Cap 2004 to 2008-09: Decision*, 10 December 2003, section 8.4.3, pp 105

[8] ibid

[9] **O**ffice of **t**he **T**asmanian **E**nergy **R**egulator

Section 6 of the Guideline outlines the annual reporting requirements for the TNSP, including general transmission system details and a selection of performance indicators. The performance data is required to assist OTTER in assessing the implementation of the TNSP's management and compliance plans. OTTER publishes these results in the annual Tasmanian Energy Supply Industry Performance Report.

The nominated performance measures are:

- **Management Plan Performance**
  - Transmission line circuit availability;
  - Transformer availability;
  - Capacitor bank availability;
  - Loss of Supply Event Frequency Index - number of events > 0.1 system minutes; and
  - Loss of Supply Event Frequency Index - number of events > 2.0 system minutes.
- **Asset and Vegetation Management Plan**
  - Progress against key milestones for capital expenditure projects;
  - Progress against key milestones for operational expenditure projects; and
  - Programmed major capital works for coming financial year with milestones for completion of major stages;
- **Emergency Management Plan**
  - Progress of implementation;
- **Compliance Plan**
  - Progress of implementation;
- **Jurisdictional Transmission Planning Criteria**
  - Performance in meeting each of minimum network performance requirements;
  - Explanation of any failure to comply;
  - Actions to rectify any failure;

- **Direct Connect Firm[10] Connection Site Performance[11]**
  - Availability, security and supply availability performance;
- **Direct Connect Non-Firm[12] Connection Site Performance[13]**
  - Availability, security and supply availability performance.

[10] Firm connection sites have N-1 rating or better

[11] Excepting where connection site target performance is subject to connection agreement and performance is reported annually directly to customer

[12] Non-Firm connection sites have N rating

[13] Excepting where connection site target performance is subject to connection agreement and performance is reported annually directly to customer

5. Excluded Events

SKM has found during audits of performance reporting by TNSPs in recent years, the evaluation of individual network events that may be excluded from performance calculations have necessitated interpretation of both the intentions of the AER service standards scheme, and the definitions available for excluded events.

5.1 Force Majeure

The generic definition of Force Majeure proposed by SKM during the development of the service standard regime was based on an extract from the previous National Electricity Code. It was deliberately non-specific, as there was provision for the AER to adopt a definition for Force Majeure that had been historically used by a TNSP in evaluating and reporting data to any previous jurisdictional entity.

For Transend, the following is the definition included in the current determination and the STPIS, and should be applied in any evaluation of historical data:

"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 and 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."* [14]

5.2 AER Considerations

In the STPIS, the AER provided a broad definition of Force Majeure.

The AER has previously emphasised that "*… only in exceptional circumstances an event will be excluded from the performance-incentive scheme*"[15] and that "*… will do so only after carefully considering all relevant circumstances.*"[16]

To allow for a case-by-case evaluation of events, the AER listed four (4) considerations in the STPIS for determining what events should be excluded from performance measurement. 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?

5.3 Negotiated Customer Connections

In reviewing Transend's existing performance incentive scheme, SKM sought to determine the influence that Transend's "direct connection" customers, such as generators, and major industrial consumers, exert on the transmission system as a whole.

It has been previously documented that some 58% of the total Tasmanian load is consumed by major industrial customers, with 56% of the total load on Transend's transmission system, comprising the combined demand of only 5 (five) major industrial load centres, and 1 (one) major retail load centre.

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[14] AER, *Final Decision – Electricity Transmission Network Service Providers - Service Target Performance Incentive Scheme*, August 2007, Appendix D, pp 37.

[15] ACCC, *Statement of principles for the regulation of transmission revenues – Service standards guidelines*, 12 November 2003, section 4.3.5, pp 8

[16] ibid

In its July 2002 submission, "*ACCC: TNSP Service Standards : Transend Report*" (refer Table 1), Transend illustrated the influence that outages within these major centres had on the total System Minutes, emphasising the fact that a single 15 minute outage at Transend's largest industrial customer would constitute a loss of over 2½ system minutes. This remains the situation to the present day.

- **Table 1 Analysis of Connection Points for System Minutes**[17]

Load Centre	System Minutes at average load for Outage Duration of	
	15 Minutes	30 Minutes
Major Industrial Direct Connect : A	2.57	5.14
Major Industrial Direct Connect : B	0.99	1.98
Major Industrial Direct Connect : C	0.81	1.62
Major Industrial Direct Connect : D	0.66	1.32
Distribution System : E	0.57	1.14
F (all remaining)	range 0.34 - 0.005	range 0.67 - 0.01

Taking into consideration the TNSP Service Standards' high level principles 1 and 2, which seek to ensure that a TNSP is 'accountable' only for performance outcomes "*that it can control, or which it is best placed to manage*" (Principle 1), and over which it has the "*Powers to Act*" (Principle 2), SKM sought to determine whether any clause or theme within the contracts Transend has entered into with these major industrial customers, or other negotiated connection customers, impinged on Transend's performance 'accountability' in any way. Should any of Transend's negotiated customer connection agreements create such a situation, SKM would recommend the exclusion of any transmission system assets associated with the connection from the PI Scheme applicable to Transend during the next regulatory reset period.

SKM also sought to establish any possible implications of one or more of these negotiated customer connection agreements allowing for premiums to be charged by the TNSP for agreed higher levels of service, or conversely, discounts being given to the direct connection customer for agreed lower service levels. In such cases it has previously been noted, by the then ACCC, that a TNSP should not receive any financial reward, or penalty, under the PI Scheme. This sentiment was recently affirmed[18] by the AER. Should any of Transend's current or future negotiated

[17] Transend Networks, *ACCC: TNSP Service Standards –Transend Report*, TNM-SR-809-0020, Issue 1.0, July 2002, pp 16

[18] AER, *Final Decision – Electricity Transmission Network Service Providers - Service Target Performance Incentive Scheme*, August 2007, Appendix B, Part 3, pp22.

customer connection agreements create such a scenario, SKM would again recommend the exclusion of any transmission system assets affected from Transend's PI Scheme for the next regulatory period.

6. Proposed Suite of Performance Measures

The following discussion outlines the bulk of SKM's analysis undertaken on the historical performance data supplied by Transend, and puts forward a proposed suite of performance measures based on SKM's consideration of the objectives of the AER's STPIS, and taking into account the feasibility of applying the STPIS measures within the context of the Tasmanian transmission system.

6.1 Proposed Performance Measures

6.1.1 Circuit Availability

Circuit availability measures the time that the transmission system's circuits are in service, or are fit and ready for service. By default, it also provides a measure of the percentage of available time that the transmission system circuits are unavailable, due to a combination of planned, forced, and fault outages. As previously stated, the circuit availability measure was chosen because it is considered to be of particular interest to the wholesale generation market, with increasing importance after the Tasmanian market's entry into the NEM.

Transend currently reports to the AER on this measure, in two separate categories:

- Circuit Availability – Transmission Lines; and
- Circuit Availability – Transformers.

SKM reviewed the available background literature in its consideration of the ongoing relevance of this particular measure and its sub-measures, including:

- the ACCC "Transmission Network Service Provider – Service Standards – Final Report" of March 2003;
- the AER, Final Decision– "Electricity Transmission Network Service Providers - Service Target Performance Incentive Scheme", August 2007; and
- the National Electricity Rules (version 14) Chapter 6A, Section 7.4.

Historical data provided by Transend was also analysed in order to draw quantitative conclusions on the relevance of any theories derived during the literature review.

6.1.1.1 Critical / Non-Critical Circuits

SKM is of the opinion that it is the intention of the AER to move towards measures of circuit availability that more clearly identify critical and non-critical circuits.[19] SKM sought to develop a clear and appropriate definition of 'criticality' applicable to Transend's transmission system. In conducting this review, SKM considers the intention stated by the AER to develop an improved service standards incentive scheme, through placing greater emphasis on performance measures that take into consideration the potential "market impact" of various levels of circuit availability.[20]

In consideration of the AER's underlying rationale for measuring circuit availability and its impact on the various participants within the NEM, SKM reviewed the criticality classification of transmission lines against the current differentiation within of the transmission system of areas under Direct and Indirect NEMMCO oversight. Those areas under direct oversight by NEMMCO have been considered to constitute Transend's critical circuits, and areas under indirect oversight as the non-critical circuits. SKM developed a further consideration that, due to their lack of impact on participants within the NEM, the radial portions of the transmission system currently included within Transend's area of direct oversight by NEMMCO would also be deemed to be non-critical circuits.

SKM also performed preliminary availability analysis on a range of possible alternate divisions of Transend's circuits, including an examination of areas of the transmission network that operate at 220 kV, compared with those of 110 kV, and the various 44 kV, 22 kV and 11 kV sections. However, it was decided that any such division into nominal voltages, or possibly asset categories, would be of little significance to Transend's customers, and therefore not aligned with the AER objectives in seeking to improve reliability for customers. As a result, SKM did not consider this division of the circuits warranted further investigation.

Taking into consideration the level of information within the data made available to SKM for circuit availability, covering the periods 2000-2006, SKM considers that Transend should be able to provide circuit availability separated into critical and non-critical circuits without difficulty, based on the use of NEMMCO direct and indirect oversight as suitable proxies for critical and non-critical circuits. The historical data available would also allow Transend to develop relevant targets,

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[19] AER, *Final Decision – Electricity Transmission Network Service Providers - Service Target Performance Incentive Scheme*, August 2007, pp 12.

[20] AER, *Service Target Performance Incentive Scheme : Developing incentives based on the Market Impact of Transmission Congestion - Issues Paper*, June 2007

based on five (5) year averages, for these two (2) newly defined measures, replacing the previous circuit availability (total) measure.

In terms of establishing the 2 sub-measures for transmission circuit availability, SKM considers it appropriate to exclude any " … *dedicated connection assets that supply a customer who has negotiated a higher (or lower) level of service required by the code, where that customer has agreed to the cost (or discount) for that higher (or lower) level of service*".[21]

6.1.1.2 Peak / Off-Peak Circuit Availability

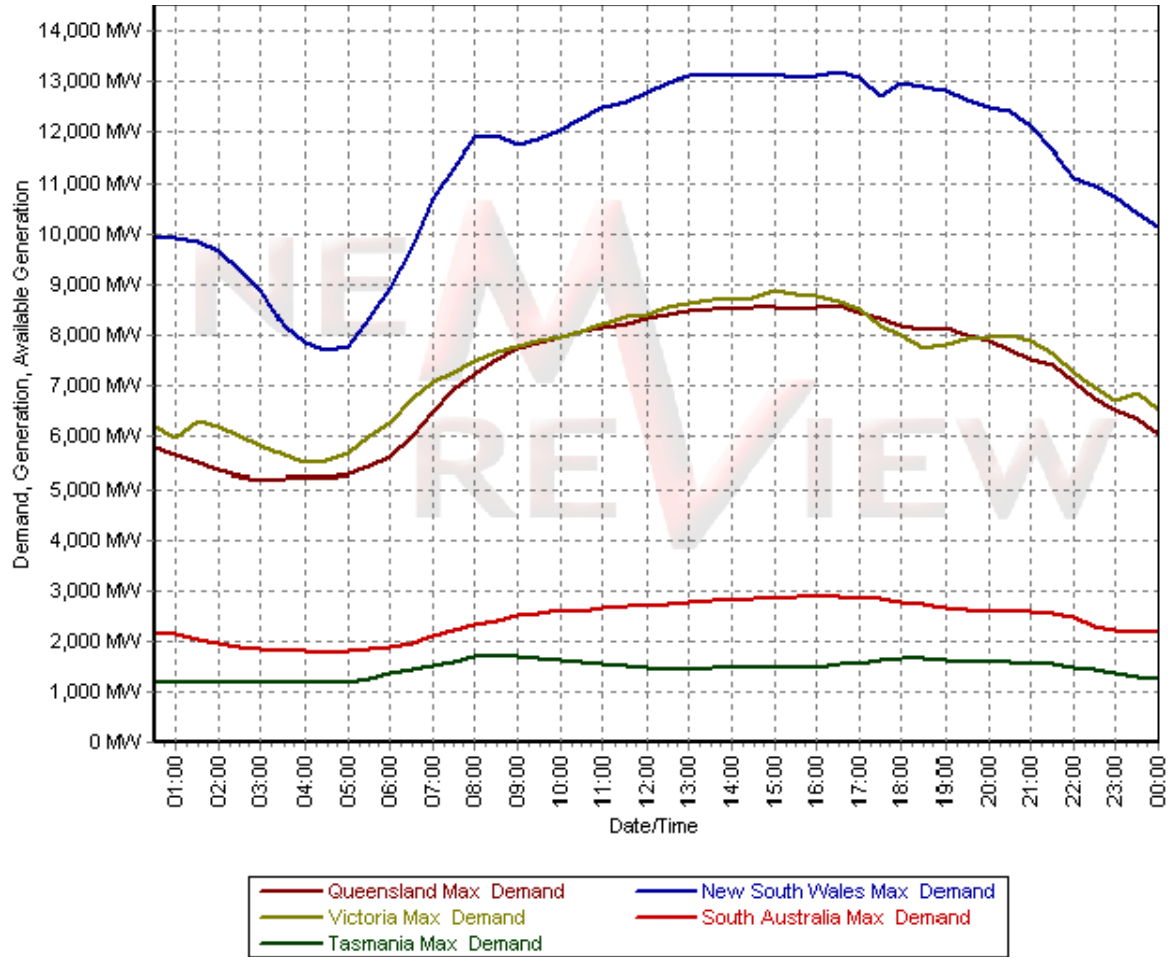
The AER has indicated a preference to separate the reporting of TNSP performance for circuit availability into divisions of *'peak'* and *'off-peak'* times. SKM is concerned that Transend will have difficulty developing relevant measures and targets with a division into peak and off-peak times that meet the requirements of the AER's STPIS. Further to this, as will be illustrated through the discussion below, any such time based split could potentially create a situation where the implementation of a performance incentive could be counter-productive to the underlying intention of the STPIS.

As discussed in section 5.3, the Tasmanian transmission system has five major industrial customers that comprise over 50% of the total system load in Tasmania. The nature of the industries within which these five major customers operate entails that their demand is relatively constant over any 24 hour period, the consequences of which are that Transend would have difficulty in identifying a period of peak demand within a typical day.

The nature of the demand experienced within Tasmania was depicted in the submission made by Major Energy Users Inc to the AER transmission guidelines in May 2007. Figure 1 shows the maximum demand in each NEM region, averaged by time-of-day, and clearly illustrates the relative uniformity of electricity demand in Tasmania.

[21] AER, *Final Decision – Electricity Transmission Network Service Providers - Service Target Performance Incentive Scheme*, August 2007, pp 22.

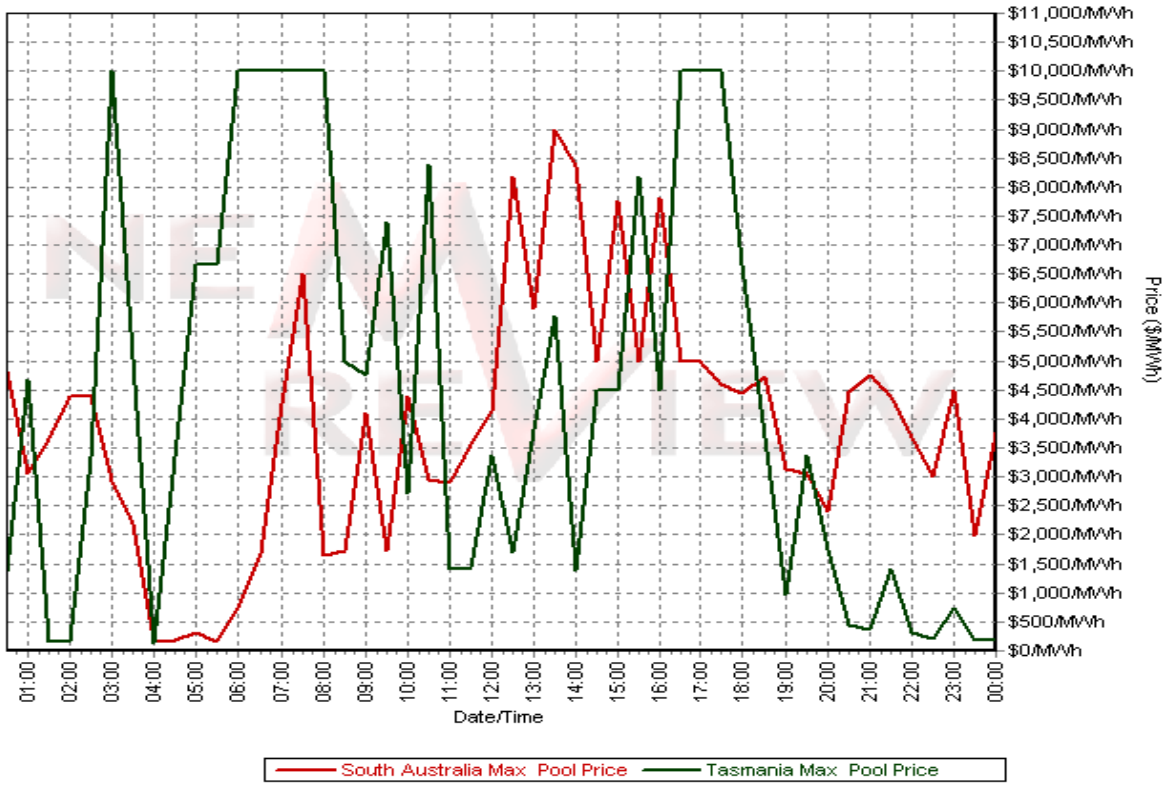
- **Figure 1 NEM Regional Maximum Demand between 13.12.1998 and 25.04.2007**[22]



[22] Major Energy Users Inc, *Australian Energy Regulator - Transmission Guidelines: Comments on the Draft Guidelines*, May 2007, pp 34

Figure 2 shows the highest spot price related to time-of-day for Tasmania, and demonstrates that there is no correlation between a period of higher demand and higher prices.

- **Figure 2 NEM Regional Spot Prices between 13.12.1998 and 25.04.2007**[23]



The nature of Hydro Tasmania's generation is also such that prospective circuit availability is equally important during the more traditional off-peak night time hours, as it is during the hours of daylight. This situation, previously brought to the attention of the then ACCC in a Transend report[24], has now been amplified through the Basslink connection to Victoria.

The relatively unique climatic conditions in Tasmania, when compared to the other States and Territories of Australia, have the potential to exacerbate some of the issues related to developing measures of peak and off-peak demand. One of the primary reasons behind the division of circuit

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[23] Major Energy Users Inc, *Australian Energy Regulator - Transmission Guidelines: Comments on the Draft Guidelines*, May 2007, pp 35

[24] Transend, *ACCC: TNSP Service Standards Transend Report (TNM-SR-809-0020)*, issue 1.0, July, 2002, pp 9

availability into peak and off-peak times is considered to be to develop initiatives and incentives for a TNSP to undertake much of its necessary works program during the off-peak periods, when any loss of circuit availability would have a less detrimental affect on the TNSP's various customers or any NEM participants and the market.

Maintenance during hours outside of daylight poses some significant engineering concerns in Tasmania. Having a greater comparative number of days reaching dew point, (see Appendix C), creates a situation where undertaking even typical routine maintenance procedures during these relatively colder, wetter, night-time hours, could lead to actions and decisions that are contrary to industry best practice. For example, the timing of maintenance or a commissioning assignment that typically requires the opening of sensitive transmission equipment would potentially be encouraged to be done during off-peak night hours, when sound engineering practice would suggest that such equipment should not be exposed to damp environments.

Assuming that the peak and off-peak identifiers are being considered by the AER in an attempt to promote and ensure improvement in the various TNSP's operations at times when the customers themselves derive most value from the supply, SKM considers that, in the case of the Tasmanian transmission system, Transend is currently held accountable for such availability of supply when their customers most value it through the various negotiated connection agreements already in place, or able to be negotiated, and which cover the a significant percentage of the overall supply and demand.

Therefore, with consideration of the nature of the Tasmanian demand, lack of correlation between prices and demand patterns, and potentially counter-productive engineering practices, SKM is of the opinion that it is not practical to classify any portion of the operational day within the Tasmanian transmission system as either peak or off-peak time, and therefore the notion that applying such a definition within Transend's PI Scheme is not considered appropriate.

6.1.1.3 Circuit Availability – Transformers

It is proposed that transformer circuits have a separate circuit availability measure because:

- transformer circuit availability has been reported in the past;
- there is confidence in the measure;
- transformers are a different asset class to transmission lines, with different maintenance practices, profiles and support staff;
- transformers and their associated assets comprise a large part of the network base; and
- NER clause 6A.7.4 states that one of the principles of the STPIS is to provide incentives to provide greater reliability, and transformers have a significant impact on the reliability of the transmission system, especially as seen by customers.

It is not proposed to split transformer circuits into critical and non-critical groups as is recommended with transmission line circuits. Note that the critical / non-critical split with transmission lines is an attempt to focus on those lines whose reliability is important in determining spot prices (refer NER clause 6A.7.4).

The reasons are:

- the consequent extra measure would decrease the effectiveness of any particular measure;
- critical transformer circuits would most commonly be network transformer circuits. However, network transformer circuit reliability has comparatively little impact on the determination of spot prices. To date, nearly all market impacting constraints have been due to transmission line circuit reliability;
- the low population of network transformers would result in a highly variable and less predictable availability with greater risk;
- network transformers are likely to be subject to an inconsistent works program over the life of the regulatory period; and
- Mean Time Between Failures (MTBF) and Mean Time To Repair (MTTR) for network transformers is relatively long.

6.1.2 Loss of Supply Event Frequency Index

The Loss of Supply Event Frequency Index was derived to measure the impact, on Transend's customers, of the unavailability of Transmission Supply, and chosen as part of Transend's suite of measures due to its importance to end users and retailers. Planned interruptions, defined as interruptions having more than 24 hours notice, are not included in these calculations.

SKM undertook analysis and modelling of loss of supply data, supplied by Transend, for the period February 2002 to December 2006 (refer Appendix A). SKM sought to better understand whether patterns within this data would allow conclusions to be drawn regarding the relevance of the current thresholds set within this specific performance measure.

The current targets for Loss of Supply (LOS) events are 3 incidents for events lasting >2.0 system minutes, and 16 incidents for events lasting >0.1 system minutes.

The data was separated into sets containing loss of supply events recorded in areas of direct NEMMCO oversight within the transmission system, events recorded in areas that are listed under indirect NEMMCO oversight, and in more recent times, any events recorded because of Transend's connection to Basslink.

In analysing the loss of supply data supplied by Transend, SKM identified that a significant percentage of LOS events included as part of Transend's PI Scheme during the 2005/06 period

originated within areas of the transmission system that operate at 88 kV, 22 kV, and 11 kV. Whilst such assets would generally be considered to be distribution assets, these are considered to constitute an integral part of the Tasmanian transmission system.

SKM's analysis determined that up to 70% of overall number of loss of supply events within the transmission system occurred in areas of indirect oversight. However, the greater percentage of total loss of supply measured in system minutes is attributed to the area of direct oversight, up to 60% in 2005/06 financial period. This is credible considering the significantly larger proportion of the overall system load that falls within the direct oversight category. However, this situation strengthens the requirement to establish Transend's overall control, and therefore accountability for the performance of the transmission assets within these different categories.

Trends identified within the data provided, and historical submissions to the relevant regulatory bodies, suggest that Transend has been working closely with customers in investing appropriate levels of capital, for targeted physical asset upgrades and replacements, and developing stringent operations and maintenance programs, which has lead to improved performance within these important areas of a TNSP's operation. This demonstrates that the loss of supply measurements are serving their intended purpose in providing adequate incentive to the TNSP to continually improve on previous performance levels attained.

Table 2 and Table 3 illustrate Transend's performance since 2000 against the current targets for the two (2) Loss of Supply Event measures.

- **Table 2 Loss of Supply Events > 2.0 System Minutes**[25]

	Events > 2.0 System Minutes							Mean	5YR AVG	5 YR Median
Calendar Year	2000	2001	2002	2003	2004	2005	2006			
Number of events	2	3	2	0	0	3	4			
less excluded events	0	0	0	0	0	3	3			
NET	2	3	2	0	0	0	1	1.1	0.6	0

[25] OTTER, *Tasmanian Energy Supply Industry Performance Report 2005-06*, December 2006, table 5-2, page 56

- **Table 3 Loss of Supply Events > 0.1 System Minutes**[26]

	Events > 0.1 System Minute							Mean	5YR AVG	5 YR Median
Calendar Year	2000	2001	2002	2003	2004	2005	2006			
Number of events	15	14	15	17	18	15	21			
less excluded events	0	0	0	0	0	3	5			
NET	15	14	15	17	18	12	16	15.3	15.6	16

From Table 2, it is apparent that Transend has consistently met or surpassed the current target of 3 incidents for events > 2.0 system minutes since 2000. However, Table 3 illustrates that Transend may still find an incentive in seeking to reach and/or exceed the target of 16 reportable incidents, for events > 0.1 system minutes, more consistently within the upcoming regulatory reset period.

In seeking to maintain a significant level of performance improvement going into the new regulatory period, SKM is of the belief that the measure for Loss of Supply Events > 2.0 system minutes may no longer provide significant incentive for Transend to maintain continual performance improvement, and requires some amendment.

An initial consideration of dropping the target for this measure from its current level of 3 to 2 was dismissed, as SKM considered that Transend would not find additional incentive to reach such a target, having already proven it is able to maintain such higher levels of performance for the past five (5) consecutive years. As Table 2 shows, the calculated mean for such events, illustrating Transend's actual average actual performance, derived from the total Loss of Supply data provided from 2000, was already lower than 2 (calculated as 1.1), and the most recent 5 year average for the data applicable to this measure was 0.6. Any subsequent consideration of lowering the annual target further to 1 event was dismissed, as SKM is of the opinion that a target so binary in nature merely provides an 'all or nothing' situation, presenting the TNSP little or no scope to control the performance around such a target over time, and therefore not providing the "positive incentive" to improve performance that is sought by the AER. In such instances, SKM believes that the measure would merely become a performance management instrument, rather than its intended design as a means to provide incentives towards continual improvement.[27]

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[26] ibid

AER, *Final Decision – Electricity Transmission Network Service Providers - Service Target Performance Incentive Scheme*, August 2007, Section 1.4 (d), pp2.

SKM reassessed the data provided by Transend for overall number of system minutes Loss of Supply for the years 2000-2006 in order to establish whether a solution to this target setting issue was available (refer Appendix A). Within this process it was determined that by lowering the threshold for this specific measure to become Loss of Supply Events >1.0 system minute, from the current level of >2.0 system minutes, the trend towards a binary target could be avoided, by allowing a target to be created from a greater number of events that could possibly, or were likely to, occur.

Table 4 shows the results of an investigation into the number of loss of supply events that were greater than, or equal to, one (1) system minute in duration.

- **Table 4 Loss of Supply Events > 1.0 system minute**

	2000	2001	2002	2003	2004	2005	2006	Mean	5Yr Avg	5 Yr Median
Total	3	5	3	2	1	6	7			
Exclusions	0	0	0	0	0	3	4			
Net	3	5	3	2	1	3	3	2.9	2.4	3

It is SKM's consideration that the changing the measure for the longer Loss of Supply event to Loss of Supply Events >1.0 system minute will have a more significant influence over the business level drivers that would influence behaviour towards continual performance improvements.

In proposing a variation to this measure, the move towards a recalibration of the threshold and establishing a target that provided an accurate representation of Transend's "typical performance" was deemed to comply with Section 2.4(e) of the STPIS[28] in that all figures have been calculated using the most recent five years array of quantitative performance data. The proposed amendment was also seen to be consistent with the objectives in clause 4.1 of the scheme, and in so the principles within clause 6A.7.4(b) of the National Electricity Rules, as it now enhances the incentive placed on Transend toward achieving continued improvements and greater reliability of its transmission system.

In view of the findings within the data presented for analysis, SKM would recommend that, for the forthcoming regulatory reset period, a measure of Loss of Supply > 1.0 system minute be used in

[28] AER, *Final Decision – Electricity Transmission Network Service Providers - Service Target Performance Incentive Scheme*, August 2007, pp4.

place of the current measure of Loss of Supply > 2.0 system minutes. The target for this proposed measure will be constructed during stage two of the SKM review.

SKM further concluded that the measure of Loss of Supply Events >0.1 system minute should remain unchanged for the new regulatory reset period, as analysis of the historical performance data provided, established that this particular measure is still able to provide sufficient incentive towards driving the desired underlying business process improvements. The Loss of Supply Events >0.1 system minute data was evaluated with consideration for the positive advances that Transend has displayed in the measure of Loss of Supply Events > 2.0 system minutes.

In terms of the two (2) measures for Loss of Supply Frequency, SKM also brings further attention to the exclusion of any, "*dedicated connection assets that supply a customer who has negotiated a higher (or lower) level of service required by the code, where that customer has agreed to the cost (or discount) for that higher (or lower) level of service*"[29]

6.1.3 Average Outage Duration

During this review, SKM undertook analysis and modelling of data, supplied by Transend, relating to monthly outages occurring within the Transmission System. Taking into account recommendations brought about by various participants during the compilation of the then ACCC's March 2003 *Transmission Network Service Provider (TNSP) - Service Standards Final Report*, SKM sought to determine the effect of implementing both a 7 day cap, and a 14 day cap, on such outages, as a means of dealing with problematic circumstances where a single event, or small number of events, causing a system outage, would have significantly distorted the system average for such measures.

The formula used for this analysis was:

$$\frac{\text{Aggregate minutes of duration of all transmission system outages (other than planned)}}{\text{Number of events}}$$

Exclusions:

- Planned outages;
- Momentary interruptions (<1 min);
- Force Majeure events;

[29] AER, *Final Decision – Electricity Transmission Network Service Providers - Service Target Performance Incentive Scheme*, August 2007, pp 23

- Unregulated transmission assets; and
- Any outages shown to be caused by a '3rd party system' eg intertrip signals received, generator outage, customer installation, customer request or NEMMCO direction.

Inclusions:

- All emergency, forced and fault outages whether or not loss of supply occurred; and
- Includes outages on all parts of the regulated transmission system.

Transend had previously brought to the attention of the then ACCC, concerns regarding the different transmission system configurations of the various TNSPs, and how certain TNSPs may possibly be detrimentally affected by, for example, outage events registered on the PI System, post a transitory fault, due to the fact that the particular TNSP in question does not have auto reclosure installed, resulting in the circuit not being reclosed within 1 minute, and an event, in terms of the targets set within the Average Outage Duration measure, now being counted. This was thought to affect the consistency of the framework application to the various TNSPs as an alternative TNSP, that has auto reclosure installed, may not have registered an outage event, due to achieving a circuit closure time of < 1 minute, under the very same conditions.

SKM's analysis of the data reiterated that this particular measure is highly sensitive to individual instances of long duration. In order to allow for an adequate representation of actual improvement or deterioration in the TNSP's performance, the measure would require a smoothing device such as the cap on individual events with a duration greater than 7 (seven) days (10,080 minutes), that has previously been suggested. Even with such a smoothing device to assist with the control and analysis of actual performance represented by the data, the measure is still the most volatile of all the measures currently reported on by any TNSP in the NEM. The Average Outage Duration measure is also considered problematic as a performance enhancement instrument in other regards, such as in instances where the outage that is being reported on, would not have created an actual "blackout" within the Transmission System, or affected any customer connection. The "outage event" may also become lengthy in duration due to matters outside of the TNSP's control, thereby affecting their accountability. This would then possibly either lead to an excluded event, or at the very least, an event that is capped at 10,080 minutes, but which in reality could last far longer than 7 days, especially through consideration of the fact that, post 10,080 minutes, the TNSP has very little incentive to improve their performance, in terms of correcting the outage, within any particular time frame whatsoever.

SKM has concluded that a measure of Average Outage Duration, whilst important for a TNSP to measure, would possibly not provide its intended incentive as a primary driver of performance improvement in Transend's particular case. Having to maintain high levels of connection performance for the majority of its customers through stipulations within negotiated connection

agreements, as well as through the requirements to report on connection performance imposed under the OTTER reporting guidelines (refer section 6.3[30]) already establishes that Transend is currently held accountable for performance in this regard. Providing a further incentive to improve its operations in terms of connection performance, may in fact lead to a situation where the TNSP in question becomes unduly enriched for a performance level it would have reached despite the measure of Average Outage Duration measurement being introduced to its STPIS.

However, should a measure of Average Outage Duration be imposed by the AER during the new regulatory period, SKM is of the opinion that, such a measure should only be considered as secondary in nature, and thereby carry a lower weighting, in terms of its overall contribution to the amount of revenue at risk within the scheme. Further to this, SKM brings to attention the need to exclude all "*dedicated connection assets that supply a customer who has negotiated a higher (or lower) level of service required by the code, where that customer has agreed to the cost (or discount) for that higher (or lower) level of service*"[31]

6.1.4 Intra-Regional and Inter-Regional Constraints

Within the current regulatory period, Transend was not required to report on *intra* regional or *inter* regional constraint measures as part of its PI scheme, due, to a large extent, to a lack of sufficient data, as was discussed in the ACCC's March 2003 "*TNSP- Service Standards Final Report*".

As Tasmania only joined the NEM in May 2005, there was again some concern as to whether sufficient data would be available to develop relevant targets for such measures, in order to evaluate their possible application during the next regulatory period. To date SKM has not received any data, pertaining to *Intra* Regional or *Inter* regional constraints, for purposes of consideration during this review, and therefore SKM is not in a position to provide comment.

Taking into account the AER's June 2007 Issue Paper,"*Developing Incentives Based on the Market Impact of Transmission Congestion"*, it would seem that any deliberation regarding the possible implementation of such measures, in terms of the service standards PI scheme design, may now be redundant, as the topics contained within this new issue paper appears to fulfil this consideration.

SKM took no further action in assessing these measures of constraint during this review.

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[30] OTTER, *Electricity Supply Industry Performance and Information Reporting Guideline*, February 2007, pp 11-14

[31] AER, *Final Decision – Electricity Transmission Network Service Providers - Service Target Performance Incentive Scheme*, August 2007.

6.1.5 Market Measures

During the period this SKM review was undertaken, the AER released an Issues Paper entitled "*Service Target Performance Incentive Scheme: Developing incentives based on the Market Impact of Transmission Congestion – Issues Paper – June 2007"*. The paper discussed the opportunities to improve the transmission service standards regime *by, "targeting outages that have an adverse impact on dispatch outcomes* [and therefore Wholesale Electricity Market Prices] *and in doing so focus TNSPs' resources on outages that matter to market participants."* The AER purports that this will lead to *"more efficient operation of the transmission system by linking service standards incentives more directly to market outcomes"*. [32]

The paper states that previous performance measures of 'Circuit Availability' and 'Average Outage Duration', which were designed to provide an indication of a TNSP's level of reliability and availability, are considered, by the AER, to contain limitations, as in many cases "*reduced circuit availability and higher outage levels do not matter'"* as the majority, listed as up to two thirds, of such events do not cause blackouts, nor result in the dispatch of more expensive generation, and therefore have no detrimental effect on a TNSP's customers.

However, the AER goes on to explain that the structure of the Tasmanian transmission system, consisting of, *"a number of smaller generators [are] distributed across the transmission network with relatively little transmission redundancy for each of the generators"* determines that in Transend's specific case,*" most outages have a market impact."* Data provided by NEMMCO shows that in the 2005-2006 reporting period, Tasmania recorded 13 *intra* regional constraints that contributed to the Total Cost of Constraint (TCC), whereas the remainder of the NEM, combined, only recorded 9 such events during this same period.[33]

The paper contains a number of suggestions regarding how it may be possible to apply the Market Impact of Transmission Congestion (MITC) data in order to improve the existing transmission service standards regime. An issue the paper also raises is that, as only 2 (two) years worth of MITC data will exist for Transend at the time of their revenue reset, due to the fact that Tasmania only joined the NEM in May 2005, any targets established in the new scheme, based on such limited data, would need refinement over time. The AER also proposes that any new scheme would initially only be used to supplement Transend's existing service standards. The paper concludes

[32] AER, *Developing Incentives based on the Market Impact of Transmission Congestion - Issues Paper*, June 2007, pp 6

[33] AER, *Developing Incentives Based on the Market Impact of Transmission Congestion – Issue Paper*, June 2007, table 1, page 11

with an invitation by interested parties to make submissions regarding the proposed measures that have been put forward.

Based on previous discussions with Transend personnel, SKM believe that Section 4.5 'Option 5: Marginal Cost of Constraints – Outage notification' of this AER issue paper, could be of particular interest, and potential value. The section discusses the implementation of a performance incentive measure, weighted on the length of any notice period provided to the market for network outages, with the theory that *"If no notice is given, the impact is greatest, whilst if greater than 12 months notice is given, the impact is minimised'*. Such an incentive measure could be utilised to promote Transend's own internal drive towards establishing greater periods of notification for network outages.

SKM is of the opinion that any recommendation, regarding the implications to Transend's Performance incentives measures, raised by the issues presented within this discussion paper, would need to be based on a process of in-depth analysis applied to the underlying MITC data. Taking into consideration the fact that only 2 (two) years of such MITC data would be available to Transend at the date of the regulatory reset, it would be SKM's recommendation that, once established, any such measures should be assigned a lower overall weighting, relative to the performance measures currently in place, as any target derived through only 2 (two) years worth of MITC data, could not be considered highly indicative of an average performance trend within the Transend transmission system.

Appendix A Analysis of Past Performance Results

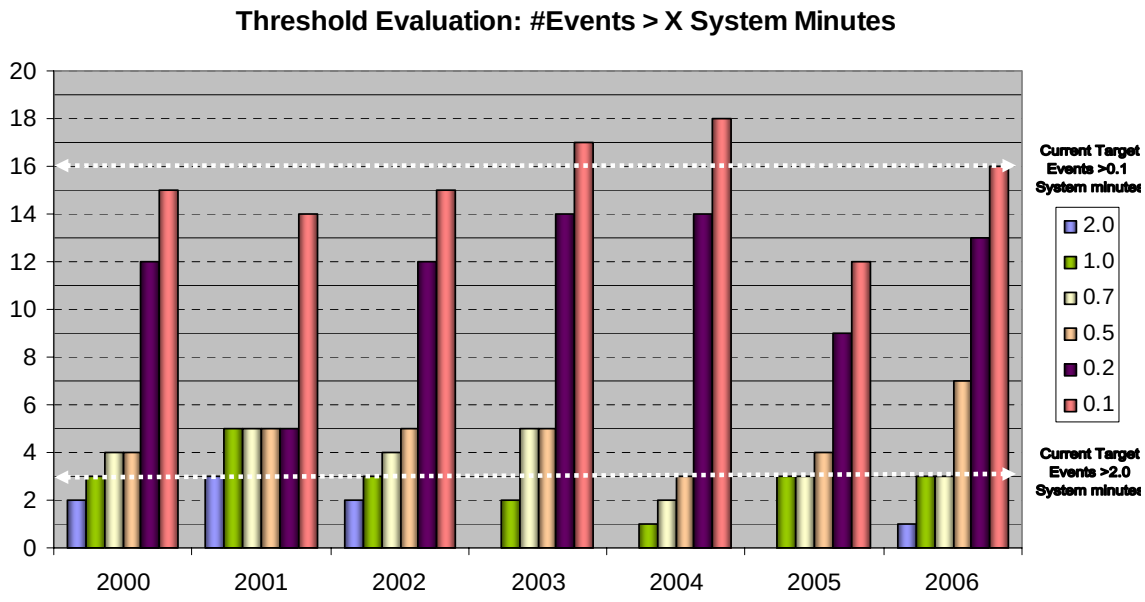
A.1 Loss of Supply Threshold Calculations

Analysis was undertaken in order to develop a more meaningful threshold for the current measure of Loss of Supply Events > 2.0 system minutes, which, due to significant improvement in Transend's performance, had reached the stage where a binary target would become necessary.

Figure 3 displays a graphical representation of the SKM analysis applied to Transend's recent historical LOS data. In this instance, events that were able to be excluded through the parameter's current definition were again removed from consideration for this section of the analysis. The results clearly indicated that the current measure of Loss of Supply Events > 2.0 system minutes was no longer providing incentives toward continuous improvement.

A number of alternative thresholds for the LOS measure were investigated, resulting in SKM's conclusion that thresholds of >1.0 system minute, and >0.1 system minute would provide the most relevant parameters in order to fulfil the objectives of the AER's STPIS.

- **Figure 3 Loss of Supply Threshold Comparisons**

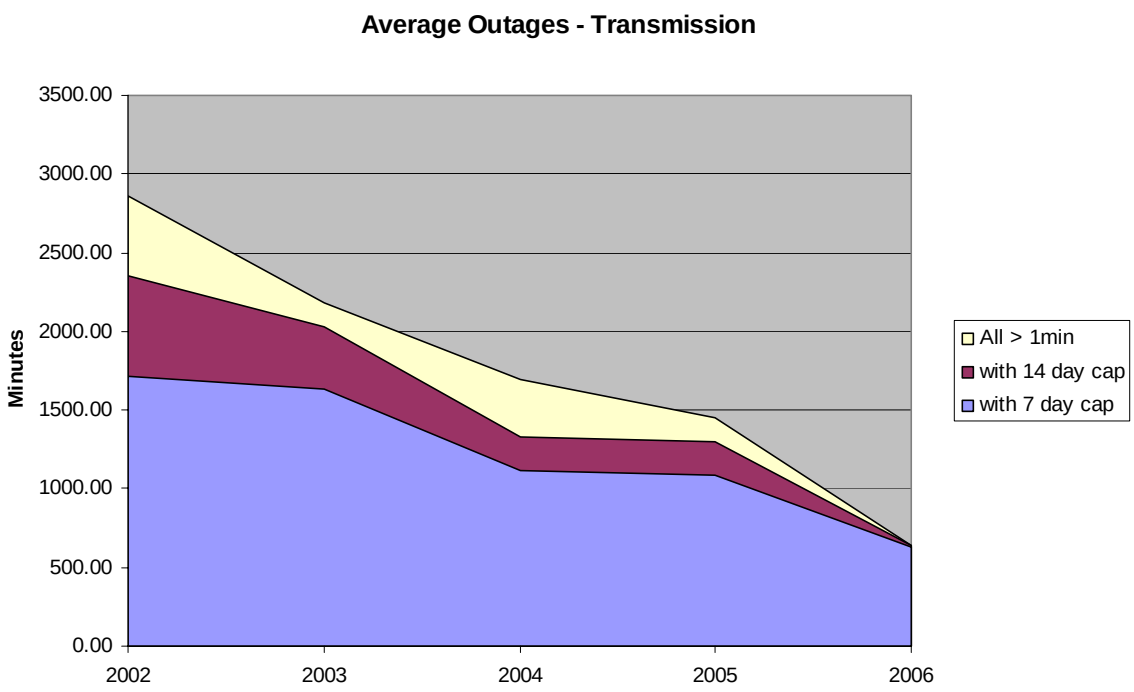


A.2 Average Outage Duration

Transmission Lines circuits average outage duration in minutes

	2002	2003	2004	2005	2006
All > 1 minute	2858.99	2181.64	1698.49	1455.26	642.49
With 7 day cap applied	1716.09	1631.97	1118.79	1084.43	633.05
With 14 day cap applied	2356.41	2028.09	1327.29	1303.21	642.49

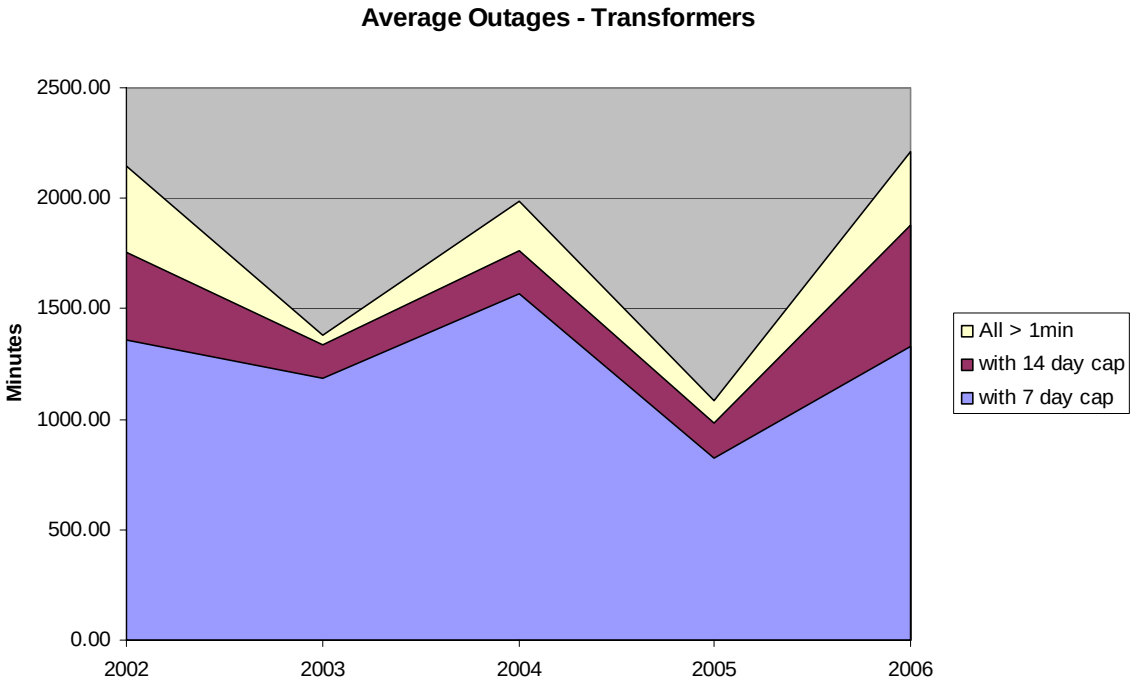
- **Figure 4 Average Outage Duration - Transmission Lines**



Transformer circuit average outage duration in minutes

	2002	2003	2004	2005	2006
All > 1 minute	2143.51	1379.09	1985.34	1085.90	2208.87
With 7 day cap applied	1356.91	1184.98	1569.40	825.21	1330.88
With 14 day cap applied	1753.20	1337.72	1765.43	985.40	1881.13

- **Figure 5 Average Outage Duration - Transformers**



Appendix B Proposed Performance Measure Definitions

- Transmission Circuit Availability ~ transmission line critical circuits
- Transmission Circuit Availability ~ transmission line non-critical circuits
- Transmission Circuit Availability ~ transformer circuits
- Loss of Supply Event Frequency Index > 0.1 system minutes
- Loss of Supply Event Frequency Index > 1.0 system minute

B.1 Measure 1: Transmission Circuit Availability

	This definition applies instead of the standard definition
Sub-measures	Transmission line circuit availability – Critical (being all circuits under Direct NEMMCO Oversight, less any radial circuits)
	Transmission line circuit availability – Non-Critical (being all circuits under Indirect NEMMCO Oversight plus radial circuits under Direct NEMMCO Oversight)
	Transformer circuit availability
Unit of measure	Percentage of total possible hours available
Source of data	Transend transmission performance reporting system
Definition/formula	Formula:

$$\frac{\text{Number of hours per annum circuits are available}}{\text{Total possible number of defined circuit hours}} * 100$$

Definition:	The actual circuit hours available for defined transmission circuits divided by the total possible defined circuit hours available.
Inclusions	'Circuits' includes overhead lines, underground cables and power transformers
	Circuit outages from all causes including planned, forced and emergency events, including extreme events
Exclusions	Unregulated transmission assets.
	Dedicated connection assets that supply a customer who has negotiated a higher (or lower) level of service required by the Rules, where that customer has agreed to the cost (or discount) for that higher (or lower) level of service.
	Circuit outages shown to be caused by a 3rd party e.g. intertrip signal, generator outage (including coincident outages), fire services direction, customer installation, customer request or *NEMMCO* direction.
	Force majeure events

B.2 Measure 2: Loss of Supply Event Frequency

This definition applies instead of the standard definition

Sub-measures	Frequency of events where loss of supply exceeds 0.1 system minute Frequency of events where loss of supply exceeds 1.0 system minute
Unit of measure	Number of events per annum
Source of data	Transend transmission performance reporting system
Definition/formula	Number of events greater than 0.1 system minute per annum Number of events greater than 1.0 system minute per annum System minutes are calculated for each supply interruption by the "Load Integration Method" using the following formula: $\frac{\Sigma \text{ (MWh unsupplied x 60)}}{\text{MW peak demand}}$ where: MWh unsupplied is the energy not supplied as determined by using NEM metering and substation load data. This data is used to estimate the profile of the load over the period of the interruption by reference to historical load data. Period of the interruption starts when a loss of supply occurs and ends when Transend offers supply restoration to the customer. MW peak demand means the maximum amount of aggregated electricity demand recorded at entry points to the Transend transmission network and interconnector connection points during the financial year in which the event occurs or at any time previously. The performance parameter applies to exit points only. Interruptions affecting multiple connection points at exactly the same time are aggregated (i.e. system minutes are calculated on the basis of events rather than connection point interruptions).
Inclusions	All unplanned outages exceeding the specified impact (that is, 0.1 system minute and 1.0 system minute) Unplanned outages on all parts of the regulated transmission system Extreme events
Exclusions	Unregulated transmission assets Dedicated connection assets that supply a customer who has negotiated a higher (or lower) level of service required by the Rules, where that customer has agreed to the cost (or discount) for that higher (or lower) level of service

Outages shown to be caused by a fault or other event on a '3rd party system' eg intertrip signals, generator outage, customer installation, customer request or *NEMMCO* direction.

Planned outages

Force majeure events

B.3 Measure 3: Average Outage Duration

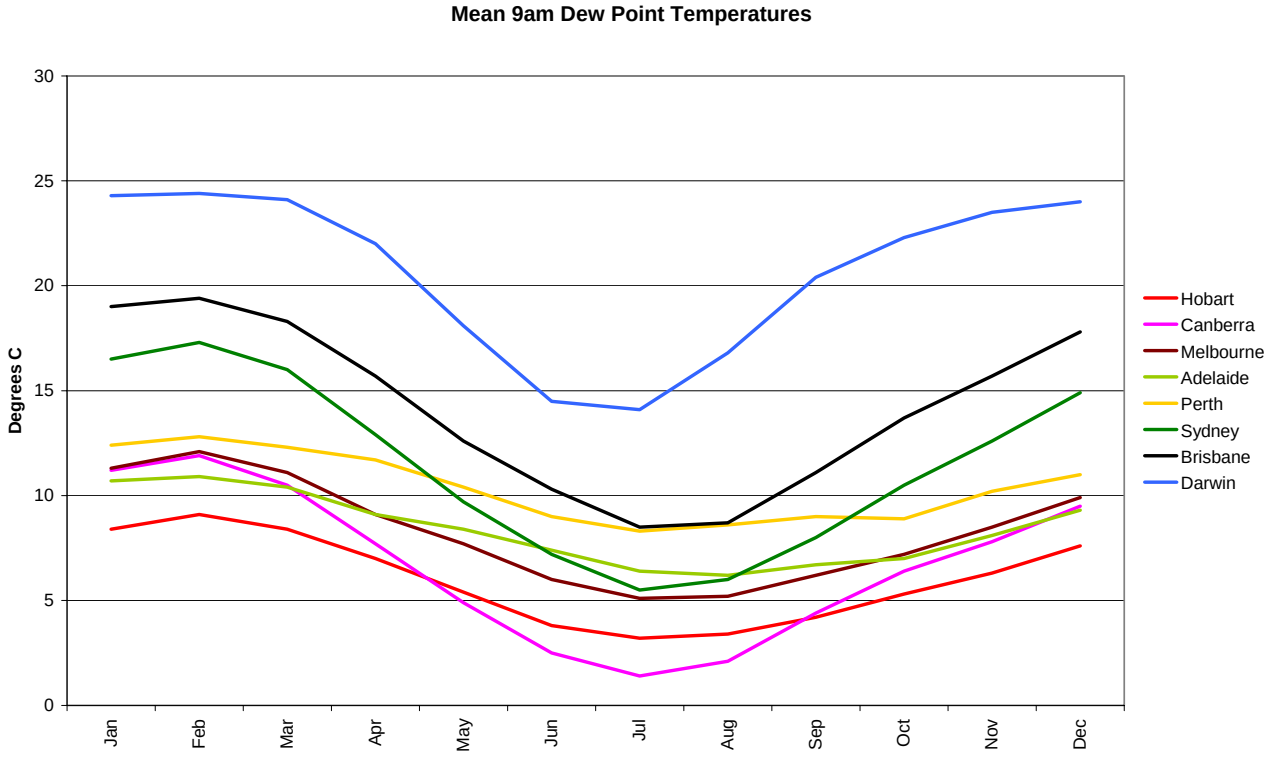
This measure does not apply to Transend.

Appendix C Comparative Average Dew Point Temperatures

Table 5 summarises the average dew point temperatures in each Australian capital city.

- **Table 5 Comparison of Dew Point Temperatures**[34]

City	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Hobart	8.4	9.1	8.4	7.0	5.4	3.8	3.2	3.4	4.2	5.3	6.3	7.6	6.0
Canberra	11.2	11.9	10.5	7.7	4.9	2.5	1.4	2.1	4.4	6.4	7.8	9.5	6.7
Melbourne	11.3	12.1	11.1	9.1	7.7	6.0	5.1	5.2	6.2	7.2	8.5	9.9	8.3
Adelaide	10.7	10.9	10.4	9.1	8.4	7.4	6.4	6.2	6.7	7.0	8.1	9.3	8.4
Perth	12.4	12.8	12.3	11.7	10.4	9.0	8.3	8.6	9.0	8.9	10.2	11	10.4
Sydney	16.5	17.3	16.0	12.9	9.7	7.2	5.5	6.0	8.0	10.5	12.6	14.9	11.4
Brisbane	19.0	19.4	18.3	15.7	12.6	10.3	8.5	8.7	11.1	13.7	15.7	17.8	14.2
Darwin	24.3	24.4	24.1	22	18.1	14.5	14.1	16.8	20.4	22.3	23.5	24	20.7



[34] Source: www.bom.gov.au/climate/averages/tables