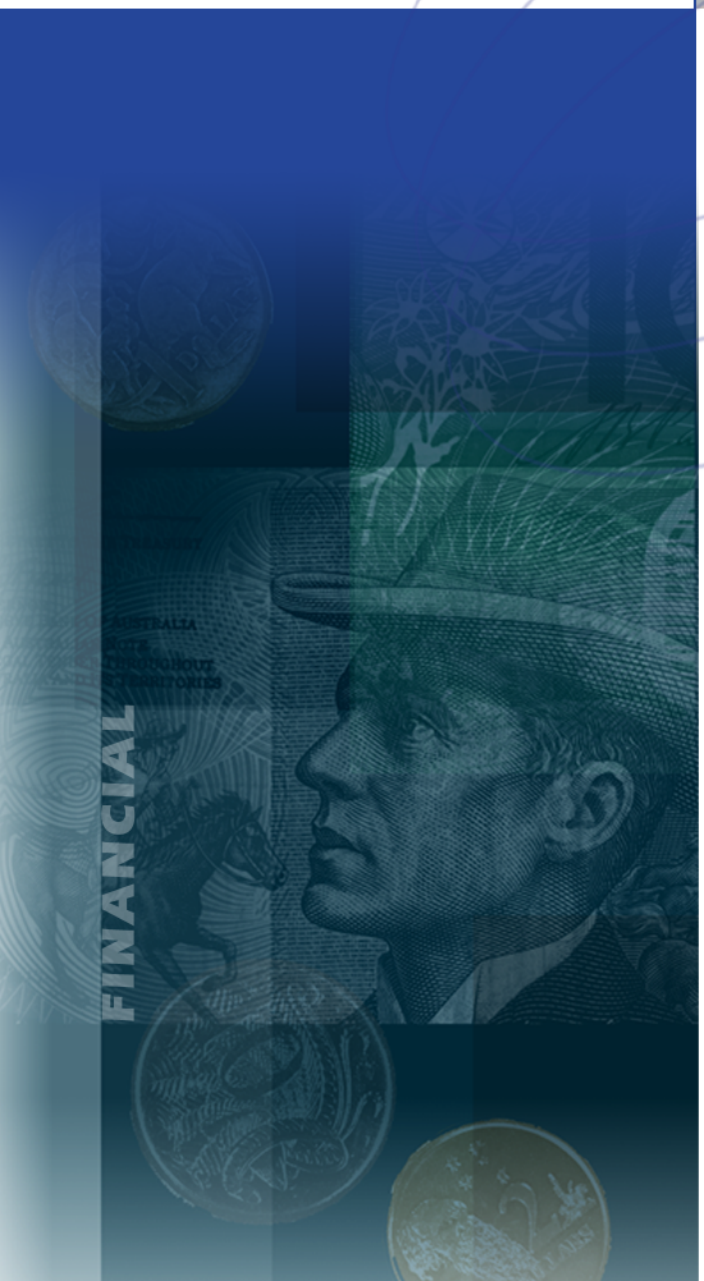
Australian Competition & Consumer Commission
Promoting Competition and Fair Trading

AUSTRALIAN COMPETITION AND CONSUMER COMMISSION (ACCC)

Transmission Network Service Provider (TNSP) - Service Standards

Stage 1 - Discussion Paper



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SKM

Australian Competition and Consumer Commission (ACCC)

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1. Introduction

Sinclair Knight Merz has been engaged by the Australian Competition and Consumer Commission (ACCC) to develop a set of service standards for Transmission Network Service Providers (TNSP's) operating in the Australian National Electricity Market (NEM).

The obligations of the ACCC, in respect of monitoring and regulating the TNSP's, are outlined in Clause 6.2 of the National Electricity Code (NEC). Further, the ACCC published on 27 May 1999, a draft "Statement of Principles for the Regulation of Transmission Revenues". This statement of principles document outlined in general terms the guidelines under which the ACCC proposed to "exercise its powers to regulate transmission revenues".

It should be noted that the various TNSPs have, or will come under the jurisdictional control of the ACCC according to the following timetable:

	Date
ElectraNet SA	01.01.2003
EnergyAustralia	01.07.1999
Powerlink	01.01.2002
SPI PowerNet	01.01.2003
Snowy Mountains Hydro Electricity Authority	01.07.1999
Transend Networks	Before Tasmania joins NEM
TransGrid	01.07.1999

Within the statement of principles document, specific reference was made to the issue of service standards for TNSP's. In particular, under section 7 of the summary, the ACCC noted that "The Commission believes that effective incentive-based regulation should include an explicit level of service, for which the TNSP has been provided by the regulators sufficient income to maintain the assets necessary to provide that level of service". The Commission further noted that "… the Commission required TNSP's to propose a single set of service standards, and proposed benchmarks for each standard, as part of their regulatory review application. The Commission will review the TNSP's application and establish a set of service standards with performance benchmarks, and a quality of service monitoring program for each TNSP under its jurisdiction."

Finally, the ACCC noted that "Penalties for non-performance of service standards will be developed and will be imposed during a regulatory review for a TNSP that does not, in the opinion of the Commission, maintain its service to customers at the benchmark level."

In fulfilment of this obligation under the NEC, and the draft Statement of Principles document, ACCC has proceeded to further develop the framework of service standards for TNSP's in accordance with the Terms of Reference document attached at Appendix A.

This is a Stage 1 – Discussion Paper, in response to the Terms of Reference.

2. Executive Summary

2.1 Background

The Australian Competition and Consumer Commission (ACCC) has engaged Sinclair Knight Merz to develop a set of service standards for Transmission Network Service Providers (TNSP's) operating in the Australian National Electricity Market (NEM). The TNSP's are those companies that own and operate transmission assets, and the companies concerned are:

- ElectraNet SA (South Australia)
- EnergyAustralia (NSW)
- Powerlink (Queensland)
- VENCorp / SPI PowerNet (Victoria)
- Snowy Mountains Hydro Electricity Authority (SMHEA)
- Transend (Tasmania)
- TransGrid (NSW)

2.2 Performance Measure Characteristics

In developing the appropriate suite of performance measures for the ACCC's TNSP Performance Incentive Scheme, a number of criteria or principles were established at the outset. One of these criteria was that the performance measures should be relatively operational in nature. They should be measures which are not only within the control of the TNSP to influence, but the results of the TNSP's endeavours should be evident during the regulatory period during which the performance incentive scheme is operational.

By implication, performance measures which require substantial capital investments or longer term strategies to be implemented before any noticeable change to the performance indicator occurs are generally not considered appropriate for the ACCC TNSP Service Standards scheme.

It will be noted therefore that the performance measures proposed in this discussion paper tend to be short to medium term measures.

2.3 Inconsistency of Existing Performance Measures

Research to date has indicated that the TNSP's in Australia currently to do not report performance, either for internal management purposes, or to their respective jurisdictional regulator, to a consistent set of performance measures. Only one measure is used universally by TNSP's, namely "circuit availability". The definitions used, and data collected and reported against this measure, are also inconsistent from TNSP to TNSP.

SKM has concluded that the current set of performance measures, and data reported against those measures is not sufficiently robust, consistently defined, or reliable enough to use as the basis for a TNSP Service Standard Incentive Scheme.

SKM's experience in the development of performance measures, and performance benchmarking is that definitional difference and data inconsistencies often make inter-company comparisons and international comparisons difficult, if not impossible. Any

performance data published in this discussion paper potentially suffers from the same definitional and data inconsistency shortcomings.

SKM positively discourages and inter-company comparisons in deriving conclusions about TNSP performance based on figures published in this discussion paper.

2.4 Market Based Performance Measures

ACCC and SKM have consulted widely with various industry stakeholders, including the TNSP's themselves, State based regulators, market participants, NECA and NEMMCO, in formulating this discussion paper on TNSP Service Standard Measures.

During these meetings and discussions several organisations and individuals expressed the view that TNSP service measures should focus on "market impact or outcomes", rather than internal technical or system focussed performance measures. SKM has researched the availability, relevance and applicability of such measures, and has concluded that measures that directly link TNSP performance with market outcomes should be "phased in" over the first 5 years of the Service Standards Incentive Scheme. Two service standard measures have been included in the initial set which are designed to capture, to an extent, the impact of transmission constraints on the operation of the market. These are:

- Hours of intra-regional transmission constraints pa.
- Hours of inter-regional transmission constraints pa.

These measures, while being indicative of the impact that constraints have on the operation of the market, do not directly link TNSP performance with the market impacts of each individual constraint or event.

2.5 International Survey

SKM has researched the range of performance measures used to measure the performance of transmission companies in various countries with advanced implementation of competitive energy market systems. These countries include the UK, New Zealand, and a selection of companies in the US.

This research indicates that similar measures to those proposed by SKM are either in use, or being considered for these transmission companies, but that the measures were often tailored differently or given different emphasis, depending on the market structure, and the functions and responsibilities of the transmission companies within that market structure. Of the 8 companies surveyed, only 3 (National Grid, San Diego Gas & Electric, Southern California Edison) are subject to any form of financial incentive scheme, as proposed by the ACCC.

2.6 Proposed Initial Performance Measures

The full range of performance measures proposed for the initial TNSP Service Standards Incentive Scheme are:

1) Circuit Availability (% pa)
2) Minutes off Supply (minutes pa)
3) Average Restoration Period (minutes per event)

4) Hours Constrained (Intra-regional)
5) Hours Constrained (Inter-regional)

In addition to the above measures, the Service Standards implementation plan makes provision for the inclusion of other "market oriented" performance measures that have yet to be fully scoped, defined and measured. Such "market oriented" measures can be implemented by ACCC during the 5 year regulatory reset period, within the framework of the incentive scheme developed by SKM.

Of necessity, the TNSP Service Standards scheme needs to be sufficiently flexible that it can be applied to TNSPs who have already undergone a revenue reset, and to TNSPs who have yet to have such a reset. SKM will design the scheme such that it can be implemented at the start of a reset, or during the period between resets. The scheme will also be designed to accommodate the development of new performance measures (such as market impact measures), together with the "ramping up" of some measures and the "ramping down" of other measures.

A fundamental premise of the flexibility designed into the scheme by SKM is that any changes to the scheme during its operation will be agreed to by the ACCC and the relevant TNSP.

2.7 Next Steps

As previously stated, the existing performance measures monitored and reported by TNSP's are not considered suitable for implementation of the Service Standards Incentive Scheme. As a next stage in the exercise therefore, SKM plans to collect 3-5 years of performance data against a consistent set of definitions and data requirements for the five (5) measures shown above.

This data will then be used to establish performance objectives for the 5 year period 2002 to 2006, or such other period that is appropriate to each TNSP. These performance objectives will in turn be used to establish the financial bonus/penalty regime to be recommended to the ACCC.

The anticipated sequence of future activities in the ACCC TNSP Service Standards Incentive Scheme is:

- Finalisation of this draft discussion paper, including detailed definition of performance measures
- Data collection from TNSPs of historical performance results against the agreed definitions
- Establishment of performance objectives for the appropriate period for each TNSP
- Determination of the design of the financial bonus / penalty regime to apply to each TNSP
- Implementation of the Service Standards Incentive Scheme for each TNSP, on a date / dates to be determined

3. Findings and Conclusions

Sinclair Knight Merz, after undertaking significant independent research, and consultation with TNSP's, NEM market participants, industry regulators, and other interested parties, concludes that the TNSP Service Standards assignment needs to be undertaken in three (3) stages. These are:

Stage 1 – Determination of the appropriate suite of performance measures, together with definitions. This is the subject of this discussion paper.

Stage 2 – Data collection of a suitable period (3-5 years) of historical results for the measures identified and defined in Stage 1. Establishment of appropriate forward looking targets for each TNSP.

Stage 3 – Development of the incentive framework of rewards/penalties for over-achievement/under-achievement of actual results, against the pre-determined targets.

This discussion paper presents the results of Stage 1 of the assignment, and the major findings/conclusions of the work to date can be summarised as follows:

- TNSP's currently use a wide range of differing measures to monitor performance. As illustrated in Appendix F, only one (1) measure (No. 5 - Transmission Circuit Availability) is used by all the TNSPs in Australia. Only two (2) measures are used by several TNSPs (namely "Energy not supplied" and "Outage Duration"). In total some thirty one (31) different performance measures are used by the Australian TNSPs, with some TNSPs reporting that they use additional measures / sub-measures for operational management purposes, that were not included in the survey.
- For the single most commonly used measure (Circuit Availability), TNSP's have inconsistent definitions and collect different data. In some cases, TNSPs define "circuit" to literally mean only overhead or underground transmission circuits. In other cases, TNSPs include main transformers, and other critical substation components. There are also differences in the inclusions / exclusions of certain events in arriving at the reported "circuit availability".
- Two states, namely Victoria and South Australia currently have incentive based financial performance schemes in place which will overlap with the scheme to be implemented by the ACCC. This overlap will be addressed in Stage 2 of the assignment to ensure that no regulatory conflict exists between the schemes.
- The industry structure in Victoria, whereby SPI PowerNet is responsible for asset management and operation, and VENCorp is responsible for planning of the shared network, makes the application of a performance incentive scheme more complex. This shared responsibility will be addressed to ensure that the application of the proposed TNSP Service Standards scheme will direct appropriate performance / price signals to the appropriate organisations.
- Some TNSP's have incentive based connection agreements in place covering the reliability of their connection assets to generators. The proposed TNSP Service Standards scheme will not conflict with these arrangements.
- In Victoria only, the security of supply and subsequent reliability of connection assets to distributors and individual large customers, is determined by the distributor / customer, not the TNSP. This arrangement does not negate the responsibility of the relevant TNSP to deliver an appropriate standard and

reliability of supply to the distributor / customer. The proposed TNSP Service Standards scheme will be sufficiently flexible to accommodate the unique structural responsibilities in Victoria.

- Most of the existing performance measures used by TNSP's are "internally focused" technical measures, although there is a general recognition of the need to develop measures that relate to the impact on "market performance". At present, the development of "market performance" measures is not sufficiently advanced for robust measures with sufficient data accuracy to be applied to the TNSPs. The TNSP Service Standards scheme will however accommodate the introduction of such measures at an appropriate time during the next 5 years.
- A review of a range of internationally used performance measures reveals a suite of measures similar to those in use, or proposed for use, in Australia. Our general findings are the performance measures in use are usually tailored to the specific structure of the market, and portability from one market structure to another is difficult. Of the five (5) measures proposed in section 2.5 of this discussion paper, only "transmission circuit availability" and "outage duration" are used in both the UK and US.
- Where "market impact" measures are used internationally, they are done so only in those countries where the transmission company (TNSP) has both the "asset management" and the "market system operator" responsibilities (eg. National Grid Co in UK).
- While there is a general recognition of the need to move to a more "market impact" set of performance measures, insufficient work has been done by the relevant bodies and working groups to define what "market impact" means, and which organisations are responsible for managing/mitigating the effects of transmission outages on the NEM. Both NEMMCO and NECA have some views on this matter, and working groups of the TNSP CEO's Cooperative Charter have commenced work on the subject. It is likely that code and regulatory changes will be needed to implement effective solutions.
- Despite all of the foregoing issues it is clear that the most significant influence that TNSPs have on the operation of the NEM today, is in respect of the availability of the inter-state interconnectors during periods of peak demand. For this reason, it is recommended that the measure "Circuit Availability" be subdivided into critical interconnectors and non-critical circuits.
- The next most important market consideration is in respect of intra-regional constraints, whereby merit order dispatch may be constrained by transmission outages within a region. NEMMCO has undertaken some initial work in defining the critical corridors in the NEM, but not sufficiently detailed to enable performance measures to be assigned at this time. For this reason, we have included the additional measures of "Hours Constrained – Intra-regional" and "Hours Constrained – Inter-regional".
- While it may be possible to define "inter-regional" and "intra-regional" constraints performance criteria, it should be noted that constraints may occur as a result of a combination of transmission and generation contingencies, that may not be attributable solely to the TNSP. This matter should be treated on a case by case basis.
- The roles, functions and responsibilities of the TNSPs in the NEM may change over time, and within the timeframe of a 5 year regulatory period. The form of any TNSP Service Standards incentive scheme needs to flexible enough to accommodate this changing role. For this reason, we propose to design the TNSP Service Standards scheme to accommodate any foreseeable changes to the roles

and responsibilities of the TNSPs in the NEM. The specific impact of such changes will need to be agreed between the ACCC and the TNSP as and when they occur.

Given all of the above, it is Sinclair Knight Merz's considered opinion that the TNSP Service Standards Incentive Scheme should be:

- To a single consistent framework of measures with a common set of definitions, exclusions and inclusions, and a consistent approach to data collection.
- Sufficiently flexible in its application to enable it to be applied to the differing state by state industry structures and organisational functions.
- A combination of "traditional" network performance measures, and "market impact" measures appropriate to the ability of the industry to be able to define, measure and hold accountable TNSPs for performance against these measures.
- Adaptable over time to accommodate the changing role and accountability of the TNSP's within the National Electricity Market.

4. Relevant TNSP Entities and Services Provided

The service standards proposed by Sinclair Knight Merz, together with the ACCC incentive scheme, shall apply to Transmission Network Service Providers within the National Electricity Market.

During the course of this assignment, the questions that continually arose were:

"What is a Transmission Network Service Provider?"
and
"What are the roles and responsibilities of a Transmission Network Service Provider?".

Based on definitions used in the National Electricity Code, a Transmission Network Service Provider (TNSP) shall be considered to be an entity which engages in the activity of owning, controlling or operating a transmission system and who is registered in that capacity with NEMMCO in accordance with participation and registration requirements as outlined in Chapter 2 of the Code.

Clause 5.2.3 of the National Electricity Code describes the obligations of a Network Service Provider including:

- compliance with any relevant connection agreements;
- provision of market and system performance data to NEMMCO; and
- satisfying power system performance and quality service standards outlined in Schedule 5.1 of the Code, including network reliability and quality of supply factors.

Within clause (e1) of this clause 5.2.3, a Network Service Provider must arrange for the management, maintenance and operation of its part of the national grid in a satisfactory operating state, minimise interruptions to supply, and restore supply as soon as reasonably practicable following an interruption.

Schedule 5.1 of the Code describes the planning, design and operating criteria that must be applied by Network Service Providers to the transmission networks which they own or control. It also describes the requirements for co-ordination between Code Participants and Network Service Providers to achieve these criteria.

The criteria and the obligations of participants are:

- those required to achieve adequate levels of network power transfer capability or quality of supply for the common good of all, or a significant number of Code Participants; and
- those required to achieve a specific level of network service at an individual connection point.

A Network Service Provider must:

- fully describe the quantity and quality of network services which it agrees to provide to a person under a connection agreement in terms that apply to the connection point as well as to the transmission as a whole; and
- ensure that the quantity and quality of those network services are not less than could be provided to the relevant person if the national grid were planned, designed and operated in accordance with the criteria set out in Schedule 5.1 and recognising that levels of service will vary depending on location of the connection point in the network.

To the extent that Schedule 5.1 does not contain criteria which are relevant to the description of a particular network service, the Network Service Provider must describe the network service in terms which are fair and reasonable.

Based on definitions used by the National Electricity Code (clause 3.11) and State based Electricity Acts, the following are definitions to be used in categorising Network and Ancillary Services:

- Network Services

  Network Services are services for electricity transfer provided by transmission entities connected to a transmission grid or supply network.

  Examples of network services:

  - providing electricity transfer capacity;
  - controlling and regulating the characteristics of electricity being transferred; and
  - providing facilities to connect work of generation entities, distribution entities or electrical installations of customers to a transmission grid or supply network.

- Ancillary Services

  Ancillary Services are services provided by electricity entities or customers through the operations of their works or installations in ways that are not directly related to the generation and supply of electricity, but are to ensure the stable and secure operation of an electricity system and its recovery from emergency situations. Also, these are services that are essential to the management of power system security, facilitate orderly trading in electricity and ensure that electricity supplies are of acceptable quality.

  Examples of ancillary services:

  - providing reserve to the system, including through interruptibility of load;
  - operating generating and other plant to ensure stable and secure operation of the system; and
  - maintaining an ability to restore supply to the system after a total failure of supply.

The service standard measures proposed by Sinclair Knight Merz have been developed with due consideration to these defined service requirements for entities considered to be a TNSP.

5. Consultation Process

An initial project briefing session was held at the ACCC offices in Canberra on Monday 3 December 2001, at which the views and opinions of TNSP representatives were sought regarding this project. A survey questionnaire was designed to obtain information about any existing system performance monitoring programs and data available within the TNSP's, or reported to the existing State based regulators. Each TNSP was requested to provide performance data from the past 5 years (if available).

In addition, a questionnaire was distributed to other interested stakeholders in the National Electricity Market including NEMMCO, NECA and State based regulators. This provided the opportunity for comment on service standards considered appropriate by each, covering both system performance and market impact measures.

Copies of these questionnaires and performance data spreadsheets are included in Appendix E.

After the submissions were received, individual one-on-one interviews were conducted by Sinclair Knight Merz staff with each TNSP and regulatory authority. These offered the opportunity to further understand any particular opinions or issues that were raised in their submission. These interviews highlighted any unique circumstances that were considered to apply to each TNSP, together with identifying any concerns that they may have with potential market impacts, such as planned transmission line outages.

A summary of the consultation process that has preceded this discussion paper is contained in table 6.1.

■ **Table 6.1 Consultation Process**

Date	Consultation Type	Organisations Represented	Purpose
03/12/01	Project briefing session	ACCC, SKM, Powerlink, SPI PowerNet, ElectraNet SA, TransGrid, SMHEA, EnergyAustralia	Brief TNSPs on project scope and objectives
19/12/01	Roundtable meeting of market participants	ACCC, SKM, NEMMCO, Origin Energy, TransGrid, Tarong Energy, SPI PowerNet, SAIIR, Citipower, Agility, VENCorp	Brief market participants on scope and objectives
17/01/02	Meeting	ACCC, SKM, Powerlink	Discuss statistical relevance of performance measures and other issues
21/01/02	Roundtable meeting	ACCC, SKM, TransGrid, Powerlink, ElectraNet SA, SPI PowerNet, Transend	Discussion of principles that should apply to service standards, and other issues
23/01/02	Meeting	SKM, Transend	Discuss survey response and other issues
23/01/02	Meeting	SKM, OTTER	Discuss survey results, regulatory issues / overlaps and other issues
29/01/02	Meeting	SKM, VENCorp, SPI PowerNet	Discuss survey response and other issues

Date	Consultation Type	Organisations Represented	Purpose
30/01/02	Meeting	ACCC, SKM, EnergyAustralia	Discuss survey response and other issues
30/01/02	Meeting	ACCC, SKM, IPART	Discuss survey results, regulatory overlap and other issues
30/01/02	Meeting	ACCC, SKM, TransGrid	Discuss survey response and other issues
31/01/02	Meeting	ACCC, SKM, SAIIR, ElectraNet SA	Discuss survey response and other issues
31/01/02	Meeting	ACCC, SKM, NECA	Discuss NECA views and market impact issues
06/02/02	Meeting	ACCC, SKM, NEMMCO	Discuss survey results, market impact and other issues
06/02/02	Meeting	ACCC, SKM, Powerlink	Discuss survey response and other issues
07/02/02	Meeting	SKM, QCA	Discuss survey results, regulatory overlaps and other issues
18/02/02	Teleconference	SKM, SMHEA	Discuss survey response and SMHEA system configuration
21/02/02	Meeting	ACCC, SKM, NEMMCO	Discuss survey results, role of TNSPs, direction of NEM performance measures and other issues
21/3/02	Meeting	ACCC, SKM, Dept of Industry, Tourism & Resources	Review Stage 1 discussion paper. Discuss direction of NEM performance measures and other issues
21/03/02	Roundtable meeting	ACCC, SKM, all TNSPs	Review Stage 1 discussion paper
Proposed Future Consultations			
28/03/02	Forum	ACCC, SKM, all market participants	Review Stage 1 discussion paper
TBA	Meetings as required	All market participants	Review later stages of TNSP Service Standards

6. Input & Views of Interested Parties

As part of the extensive consultation process that was undertaken, SKM has obtained and summarised as follows the input and views of not only the TNSP's, but also a wide range of market participants, state-based regulators, and other interested parties. These are summarised in the following sections.

6.1 High Level Principles

In evaluating the suitability of performance measures for the TNSP Service Standards, several general principles have been applied as follows:

Principle 1 – Sound Accountability Regime

This principle requires that a TNSP should only be accountable for outcomes that it can control, or which it is best placed to manage.

It is noted that although a TNSP cannot directly control the impacts of weather, lightning strikes etc it is in the best position to assess the likely impacts of these elements on its system and to take the necessary design decisions, and operational actions to minimise the impacts.

Principle 2 – Recognition of Individual TNSP Accountabilities and Limits on "Powers to Act"

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

There is general agreement that performance measures must reflect structural differences between jurisdictions and relative powers to act.

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.

It is generally agreed that these considerations would be taken into account and consulted upon before being decided.

Principle 4 – Emphasis Should be on Providing Positive Incentives

Performance incentives must be positive and not punitive. The NEC identifies that the regulatory regime to apply to TNSP's is to be "incentive based". TNSP's believe that this concept aims to encourage TNSP's 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.
The ACCC view is that performance incentives should have a balance between providing rewards for good performance , and substantial incentives for improvement where performance is below standard.

Principle 5 – Statistical Soundness

Performance measures must be statistically sound. Many networks 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 parameters should be relatively easy to measure, and be relatively easy to "check measure". However, simplicity should not be given preference over the fundamental issues.

This was generally agreed.

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.

This was generally agreed.

Principle 8 – Key Measures

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

This was generally agreed.

Principle 9 – Legal Context

Service standards must mesh coherently with other legal and regulatory requirements applying to TNSP's and the ACCC.

This was generally agreed.

The above descriptions of the nine (9) principles are not the full text, but more a summary to give a flavour of the concept covered by each principle.

A meeting of the TNSP's, ACCC, and SKM was held on 21 January 2002 to discuss and agree on the principles. While there was general agreement on the principles, there were differing views on the emphasis that different parties placed on the likely outcome of the applications of the principles.

6.2 TNSP Response to Questionnaire

The responses of the Australian TNSPs, to the SKM questionnaire regarding the use of performance measures, are summarised in Appendices F and G.

Appendix F indicates whether a particular TNSP utilises each particular performance measure or not. Appendix G indicates the actual results that each TNSP achieved against a performance measure over the past 5 years (where available).

6.2.1 ElectraNet SA (South Australia)

In response to the SKM survey questionnaire, ElectraNet SA submitted, in addition to some performance data, a Draft Service Standards Discussion Paper. This discussion paper addressed a number of important issues concerning the setting of service standards, as well as proposing a potential set of service standards measures.

ElectraNet SA point out that their connection agreements with its customers set out the specific terms and conditions that have been agreed for the provision of connection and transmission network services. The service quantities required by the customer at each connection point are specified in the connection agreement along with the Agreed Maximum Demand and agreed level of service reliability. ElectraNet SA argue that these agreements are principal determinants of ElectraNet SA's total revenue requirements.

ElectraNet SA further propose that network performance standards must be consistent with the following principles:

- Service standards should be reasonable and appropriate for each regulated TNSP.
- ElectraNet SA should only be held accountable for things that are within its control.
- Network performance standards must be consistent with the standards set for planning and developing the network.
- Network performance standards must be consistent with the standards and criteria set for operation of the network.
- Standards set for network performance must be consistent with the capex and opex allowances included in the total revenue requirements by the regulator.

With respect to the implementation of financial incentives for network performance, ElectraNet SA expressed support for "the careful use of reliability indicators, but expressed concern that commercially significant sanctions based on benchmark levels of performance not be unduly simplistic, and be within the reasonable control of TNSP's to impact on the outcomes".

ElectraNet SA also make the point that performance incentives that impact on a TNSP's revenue cap from year to year must be well targeted and focussed on influencing short-term behaviour of the TNSP, rather than long term system security criteria which cannot be changed to improve an undesirable trend, within the timeframe of a particular revenue reset period.

ElectraNet SA is subject to a financial incentive/penalty scheme under existing service standard obligations that they have with the South Australian Independent Industry Regulator (SAIIR), under the South Australian Transmission Code. This obligation is explored further in Section 6.3.2.

ElectraNet SA proposed a suite of performance measures as follows:

- Transmission circuit availability.
- Connection point interruption frequency.
- Connection point interruption duration.
- Number of loss of supply events greater than 0.2 system minutes (measure developed and proposed by Powerlink, Qld).
- Number of loss of supply events greater than 1.0 system minutes (proposed by Powerlink, Qld).
- System minutes not supplied, broken down by meshed and radial networks.
- SAIIR system minutes lost (modified).
- Unplanned transmission circuit outage frequency and average duration, broken down by meshed and radial networks.
- Interconnector availability capacity factor (yet to be defined).

6.2.2 EnergyAustralia (NSW)

In response to the SKM survey, EnergyAustralia reported that the only nominated measure they used is "transmission circuit availability". They have been monitoring this measure for only 12 months, and any outages on their transmission system had zero, or minimal impact on the operations of the NEM. In the case of EnergyAustralia, their transmission system included about 616km of 132kV circuits, plus about 50km of 66kV subtransmission circuits that support the transmission system.

Being fundamentally a Distribution Network Service Provider (DNSP), EnergyAustralia reports on the standard reliability indices of SAIDI (System Average Interruption Duration Index), CAIDI (Customer Average Interruption Duration Index) and SAIFI (System Average Interruption Frequency Index). The figures reported against these indices include outages on EnergyAustralia's transmission, subtransmission, and distribution networks, thereby reflecting the reliability performance of the entire network.

EnergyAustralia reports the performance of its network in other ways that principally reflect its distribution function, but capture the transmission portion of its network. These include:

- Network complaints and investigations.
- Quality of supply.
- Reliability by distribution area.
- Unsatisfactory reliability by distribution feeders.

EnergyAustralia are not currently subject to a financial incentive/penalty scheme for the performance of their transmission or distribution networks.

6.2.3 Powerlink (Queensland)

Powerlink noted in it's response to the SKM survey that while it reported on a number of service standard measures, some of this reporting was for historical reasons (eg. shareholder requirements), and that some of the measures historically used (eg. SAIDI, SAIFI) were inappropriate for transmission companies.

Powerlink have undertaken considerable research into the most meaningful way of measuring and reporting on system performance. In addition to the traditional measures of energy not supplied, transmission circuit availability, outage duration, and

number of outages, they also monitor and report on the following three additional measures:

- Total number of loss of supply events >0.2 system minutes.
- Total number of loss of supply events >1.0 system minutes.
- Percentage of unplanned connection point interruptions not restored within 3 days.

It is Powerlink's view, substantiated by statistical theory, and about 12 years of data collection and analysis that some traditional measures of power system reliability (eg. SAIDI and SAIFI) when applied to a transmission system are not so much a measure of a well managed and well performed power system, but rather a measure of the impact of external environmental factors on that system (eg. storms, cyclones, floods, etc).

Powerlink have developed a statistical technique, based on control chart theory which monitors the performance of their transmission system by measuring the number of significant outage events having an impact of greater than 0.2, and 1.0 system minutes lost. The selection of 0.2 and 1.0 minutes is somewhat arbitrary, and is designed merely to identify the position of two fixed points on a performance line. This "performance line" represents the underlying reliability characteristic of a particular power system, and is unique to that power system. Once established, actual future performance can be analysed for significant variances using standard Poisson control charting techniques. For the Powerlink transmission system, the Poisson means are:

- Total number of loss of supply events greater than 0.2 system minutes (summer) – 1.3.
- Total number of loss of supply events greater than 0.2 system minutes (winter) – 0.8.
- Total number of loss of supply events greater than 1.0 system minutes (summer) – 0.4.
- Total number of loss of supply events greater than 1.0 system minutes (winter) – 0.07.

Different Poisson means would apply to different transmission networks.

In summary, Powerlink states that it supports the ACCC's intention to further develop service standards, but that it does not support:

- The use of simplified annual targets.
- The development of annual targets that are not statistically sound.
- The use of measures which are unable to differentiate between a reduction in service standards, and normal variations in the measures.

6.2.4 SPI PowerNet (Victoria)

This review of the Victorian TNSP arrangement presents the SPI PowerNet/VENCorp situation as a single integrated structure. While it is not suggested that the two organisations have identical views on the subject of TNSP performance measurement, it is important to understand the different but complimentary roles of the two organisations. Both VENCorp and SPI PowerNet provided discussion papers and

commentary on the arrangements in Victoria, together with details of the existing TNSP Performance Incentive Scheme that operates between the two organisations.

VENCorp is an independent Victorian Government Corporation charged with the responsibility of transmission planning for the interconnected (or shared) network. The planning function and investment decision making for the connection assets (generally radial to a single customer/distributor) is the responsibility of the relevant connected party (customer/distributor). This is done in conjunction/consultation with VENCorp.

The assessed annual value of outages for each circuit element takes into account the following factors:

- The expected level of annual outages derived from benchmark standards.
- Peak period/intermediate period/off-peak period.
- Loss of load (costed at VOLL) for subsequent contingency.
- Loss of generator access to market (costed at marginal cost of generator rescheduling) for subsequent contingency.
- Cost of incremental losses per hour of outage.

SPI PowerNet is penalised most severely if it plans work during peak period. The company also faces a sev[illegible]pot[illegible]tial pe[illegible]ty if i[illegible] network is [illegible]ot in a state of readiness for the critical pea[illegible]loadin[illegible]perio[illegible].

It should be noted that the performance measures placed on SPI PowerNet are all related to circuit and equipment availability and are subject to a number of exclusions, including:

- Construction (capital works) related outages
- Proximity outages (eg. 220 kV line out to enable work on 66 kV).
- Third party outages (customer initiated, roadworks, cranes, intertrips, etc).
- NEMMCO operational outages.
- Line outages linked to transformers taken out of service.
- Auto-reclose.
- Special case lines (Southern Hydro, Kiewa).
- Force Majeure.

SPI PowerNet is a privately owned asset owner/manager/operator, whose functions and responsibilities are limited to the efficient maintenance, refurbishment and operation of the existing transmission system in Victoria. SPI PowerNet has no network planning accountability for either connection assets (distributors/generator/customers), or the interconnected network (VENCorp). Consequently, the range of performance characteristics of the transmission system, for which SPI PowerNet may reasonably be held accountable, is far more limited than for the other states, where the TNSP's have an integrated planning/operational/asset management function.

The Network Agreement between VENCorp and SPI PowerNet provides for rebates to be paid to VENCorp when network elements are not available for service.

There is no direct provision for an incentive payment to SPI PowerNet for achieving superior performance. There is indirect provision of an incentive payment, in that an annual rebate value associated with expected outages is calculated in advance, and included as a component of SPI PowerNet's annual O&M expenditure budget.

The incentive payment scheme has been in operation for about 7 years, and SPI PowerNet and VENCorp are currently finalising some significant refinements to the scheme which will see the performance measures refined to be more sensitive to the peak/intermediate/off-peak periods of the NEM.

The revised performance incentive scheme between SPI PowerNet and VENCorp is due to come into operation some time after March 2001, and will see a significant increase in the assessed annual value of outages.

6.2.5 Snowy Mountains Hydro Electricity Authority (SMHEA)

SMHEA operates a 330kV and 132kV transmission system that is relatively small by Australian standards, but which connects some 3700MW of installed generation capacity at the various hydro generating stations, to the Victorian and New South Wales transmission systems.

The only generating company connected directly to the SMHEA transmission network in Snowy Hydro Trading Pty Ltd (SHTPL) and all planned connection point interruptions are made in consultation with SHTPL. Critical interconnector outages in the Snowy Region are also planned in consultation with the SHTPL and the TNSP's connected to the Snowy Region. When planning transmission outages, SMHEA is cognisant of the fact that SHTPL and other market participants intend to operate generating units predominantly on working weekdays, with a bias to the summer and winter seasons. There are no end-use customers or distributors connected to the SMHEA system.

6.2.6 Transend (Tasmania)

Transend was formed as a corporate entity on 1 July 1998. Prior to that date, much of the performance data on the reliability of the system, and other service measures was collected and recorded on the basis of a vertically integrated utility (generation/transmission/distribution).

Transend's electrical network consists of the 220kV transmission, 110kV transmission, plus substantial (although not all) 88kV subtransmission. Unlike other Australian TNSP's, Transend own and operate assets down to 11kV and 22kV (circuit breakers in zone substations).

As a result, the absolute value of certain performance indicators for Transend's system will appear to be inflated when compared with other TNSP results (eg. system minutes lost).

Transend currently report to the Office of the Tasmanian Energy Regulator against three measures, namely:

- Percentage of unserved energy.
- Transmission circuit availability.
- Annual total of unplanned outages causing loss of supply.

Transend also report reliability statistics (eg. outage duration) on a connection point basis (ie. generation connection points, distribution connection points and direct customer connection points).

Transend have indicated that they consider some performance measures to be meaningless unless they are normalised in some way (eg. numbers of outage events should be normalised to reflect the size of the system, the number of transmission elements, or the number of connection points).

Transend further state that they have considered the concept of "constraint payments" with compensation based on the costs of "out-of merit" generation. This was in the context of being limited to constraints arising from transmission outages, rather than inherent design deficiencies of the transmission system. The implementation of such provisions within connection agreements has proven to be problematic, and probably will not survive multiple and competing generation market models.

As a condition of their transmission licence, Transend must develop and maintain a suite of Licence Plans, as follows:

- Asset Management Plan.
- Vegetation Management Plan.
- Service Plan (including Service Standards).
- Compliance Plan.

Transend must report annually on their performance against these plans, and their performance against the Service Plan is detailed further in Section 6.3.1.

6.2.7 TransGrid (NSW)

In their response to the SKM survey, TransGrid indicated that they owned and operated a transmission network at 500kV, 330kV, 220kV, 132kV and 66kV. TransGrid also indicated that they currently report for regulatory purposes, against only two measures, namely:

1) Transmission circuit availability.
2) Energy not supplied (expressed as system minutes lost)
   - 3 year rolling average
   - cumulative annual result, month by month

TransGrid also have a suite of performance indicators that are used for internal management purposes, including:

- Circuit availability disaggregated by maintenance/capital, by voltage level, by planned/forced.
- Outage duration (individual events, and cumulative) for unplanned outages.

With respect to transmission circuit availability, TransGrid note that their results for this measure are affected by the level of capital works (eg. connections to the existing network), and refurbishment works (eg. the need to de-energise the existing network). They note that their results in 1999/00 were affected by QNI commissioning, 2000/01

by their overhead earthwire replacement programme, and 2002/03 will be affected by SNOVIC works and continued overhead earthwire replacement.

TransGrid statistics for circuit availability only include transmission circuits, not main power transformers, capacitor banks, SVC's, etc.

TransGrid expressed concern that "every few years" a significant event occurs, for which it is uneconomic or unreasonable for TNSPs to mitigate against. Such an event can however be so far removed from the normal performance of the system that it can adversely affect the performance of a single measure, and impose an unfair financial penalty on a TNSP, if it is included. They point to the results of 4.23 system minutes lost in 1999/00, of which 3.8 minutes resulted from two separate and unrelated events. Since they report this measure as a 3 year rolling average, these two events would adversely affect their results for 3 years of a 5 year regulatory period.

6.2.8 Transmission CEO's Cooperative Charter

It is understood that the Chief Executive Officers of the TNSPs have established a "Cooperative Charter" under which three (3) working groups have been established to ensure a consistent and cooperative approach to certain issues, common to all TNSPs, in terms of their functioning and roles in the NEM. The main focus of the three working groups are:

- Plant Ratings
- Constraint Equations
- Market Impacts (initially interconnectors)

The Market Impacts working group was set up in November / December 2001, and had met once at the time of SKM's review. It is understood that they have approached the National Retailers Forum, who have agreed to set up a committee to talk with the working group. A similar approach is to be made to the Generators Forum, and approaches / meetings are planned to be held with NECA and NEMMCO.

It is apparent to SKM that the Transmission CEO's working group on market impacts is at a very early stage of its investigations and activities, and it will be some time before any significant results are evident from their activities.

6.3 Other Regulatory Organisations

6.3.1 Office of the Tasmanian Energy Regulator (OTTER)

Transend has a licence under the Electricity Supply Industry Act 1995 to operate the main transmission system in Tasmania. Under the Tasmanian Transmission Code, Transend is obliged to report to the Regulator annually, principally against targets for service standards. There is no financial incentive scheme in place to reward improved performance or penalise poor performance.

The three primary measures used are:

- Percentage of unserved energy.
- Transmission circuit availability.
- System minutes off supply.

An annual target has been established against each service measure, and OTTER have noted in their 2000-2001 report the annual volatility, particularly in the measures "% of unserved energy" and "system minutes off supply". They attribute this volatility, at least in part to "the nature of Transend's transmission network", and "by single significant incidences, particularly on radial lines or weakly "meshed" parts of the network".

It should also be noted that Transend's reported "minutes off supply" include outages on some 11kV and 22kV distribution feeders, where the feeders are protected by a Transend 11kV or 22kV circuit breaker. This situation is unique to Tasmania, and inflates the reported "minutes off supply" substantially above what would normally be expected for a TNSP.

A Reliability and Network Planning Panel (RNPP) has been established by OTTER in accordance with the Code. The RNPP has a brief to determine some performance standards, and has set some standards for frequency control, but OTTER is currently disinclined to have transmission reliability service standards set by the RNPP, or any other prescriptive mandated process. Their current thinking is to relate the standards to some form of bidding process in the price setting mechanism (within customer class categories).

OTTER acknowledges that transmission price control will come under ACCC jurisdiction, effective 1 January 2004, however they are not clear on the ACCC's approach to performance setting. They believe that separation of price setting and performance setting involves significant regulatory risk.

6.3.2 South Australian Independent Industry Regulatory (SAIIR)

SAIIR monitors and reports on the performance of all sectors of the electricity industry in South Australia. SAIIR has put in place a performance incentive scheme (the PI scheme) with financial bonuses/penalties on ElectraNet SA, based on the following three measures:

- Operating and maintenance costs ($/kW of maximum demand).
- System minutes off supply.
- Number of supply interruptions.

In addition to the above three measures, SAIIR also report on ElectraNet's performance in respect of:

- Response times to written enquiries.
- Transmission circuit availability.
- Transmission circuit services availability,

Results against these measures are not included in the financial incentives.

It should be noted that the "minutes off supply" reported to SAIIR is not the total minutes off supply caused by outages on the transmission system. In the case of "SAIIR minutes off supply", outages on ElectraNet's connection points that are supplied by a single radial circuit (ie. Category 1 Connection Points, SA Transmission Code) are not included.

Both ElectraNet SA and SAIIR recognise that there may be significant deficiencies in the structure and selection of measures in the PI scheme, and to this end SAIIR have recently issued a discussion paper titled "Transmission Line Performance in South Australia and the SA Transmission Code".

This discussion paper says, in part:
"This discussion paper has been prepared by the South Australia Independent Industry Regulator (SAIIR) to provide a basis for consulting on possible changes to the SAIIR Transmission Code and in particular the performance incentive scheme (PI scheme) within the Transmission Code. The paper also reviews the changing role of the SAIIR in relation to the PI scheme and the current and future role of the Australian Competition and Consumer Commission (ACCC) in transmission pricing and associated performance incentives."

At the time of writing of this discussion paper, submissions on the SAIIR discussion paper had been received from 4 organisations (NEMMCO, ElectraNet SA, Origin Energy, NRG Flinders). This discussion paper does not attempt to review the relevance and validity of the SAIIR discussion paper, or the submissions made by the interested parties, except to make the observation that none of the performance measures included in the current PI scheme match those recommended by SKM.

6.3.3 Independent Pricing and Regulatory Tribunal (IPART, NSW)

Discussions with IPART predominantly centred on their view of the general role of incentive schemes for service/reliability improvement, and particularly as it applies to distribution, rather than transmission, since IPART have no jurisdictional responsibility for TransGrid, or transmission. They acknowledge the slight overlap of "transmission", with EnergyAustralia having some 132kV and 66kV "transmission" systems that are included in the reporting to IPART.

In reporting the performance of EnergyAustralia, IPART use the following measures:

- System Average Interruption Duration Index (SAIDI)
- System Average Interruption Frequency Index (SAIFI)
- Customer Average Interruption Duration Index (CAIDI)
- Transmission Circuit Availability

IPART do not currently apply a financial incentives scheme against performance measures for the distribution companies in NSW. IPART will be considering this for their next pricing review, but are likely to favour a cost assessment for reliability improvement based on different scenarios submitted by distributors (similar to ORG approach in Victoria). If an incentive scheme for improved service standards is adopted, it is likely to be "at the margins", rather than the core scheme to drive reliability/service improvement. Having said this however, IPART agree that any incentive scheme should be strong enough to drive change, and should not just be "token" in nature.

IPART also made mention of a new study proposed to be undertaken by the distributors in NSW. This study spearheaded by EnergyAustralia is designed to quantify the customer's "willingness to pay" for improved reliability and quality of supply. The study is in an embryonic stage, and is not considered further in this discussion paper.

6.3.4 Queensland Competition Authority (QCA)

The Queensland Competition Authority saw no particular regulatory overlap or conflict with the TNSP Service Standards project. In particular they observed that the TNSP Service Standards project did not seek to apply performance standards to either Energex or Ergon Energy, the two distributors that come under the QCA's regulatory responsibility.

They do recognise the issues and trade-offs associated with the total regulatory contract involving quality, service and price.

In the initial price reset for both Energex and Ergon Energy, QCA made specific allowance for the improvement of system reliability, quality of supply, and service quality, but have not linked the specific levels of performance to an incentive scheme with financial rewards/penalties. QCA indicated that they may put such an incentive scheme in place for the next regulatory review in 2004/2005. QCA made reference to work of the Steering Committee on National Regulatory Reporting Requirement, and the status of this work is covered in Section 6.3.6.

6.3.5 Essential Services Commission (ESC, Vic)

The Essential Services Commission (Vic) was approached in relation to the TSNP Service Standards assignment, but was not in a position to contribute to the exercise. SKM is of the view that there are not likely to be any regulatory overlaps, other than those identified elsewhere in this discussion paper, or other issues that would be of concern to the ESC.

6.3.6 Steering Committee on National Regulatory Reporting Requirements

The Steering Committee on National Regulatory Reporting Requirements has established a working group, the Quality of Supply working group, to review and compare the measures of network service quality currently used by State based regulators, and to develop performance measures that can be collected on a consistent and reliable basis across the jurisdictions.

The measure relate to the performance of distribution networks at high voltage levels (22 kV) and below, and therefore exclude isolated or off-grid networks (such as small networks supplied by stand-alone generating plant), and customers supplied at transmission and subtransmission voltage levels (33 kV and above).

SKM has reviewed the initial work of the working group, as contained in their "Draft Proposals" dated 2001. We have found that there is little relevance between the performance measures contained in their draft proposal and the performance measures recommended for the TNSP Service Standards. There is however no regulatory conflict or overlap evident in the work being undertaken by the Quality of Supply working group.

6.4 National Electricity Code Administrator (NECA)

NECA have established a number of working groups with terms of reference designed to address and overcome perceived shortcomings/deficiencies in the design and

operation of the National Electricity Market. The most relevant of these working groups is the RIEMNS (Review of the scope for Integrating the Energy Market and Network Services) working group.

The RIEMNS working group completed its Stage 1 final report including draft code changes, and issued a consultation paper in August 2001. This consultation paper included recommendations covering:

- Refinements to the settlement residue auction arrangements.
- A three stage process moving towards firmer access arrangements across interconnectors.
- Resolution of arrangements governing the calculation of loss factors.

The fundamental issue requiring attention from the RIEMNS working group is the availability of regional interconnectors and the specific impact on market participants. A secondary issue is the impact that this has on the settlement residue auction process.

NECA make the point that the impact of transmission constraints on the market are quite starkly specific to individual market players, and the affected market players may not be network users (eg. a trader).

NECA believe that any market based measures on TNSP's should be targeted at the regional interconnectors, and that an incentives/penalty scheme could be based on the settlements residue auction process. NECA propose that the TNSP's should play a broader role in the NEM than they currently do, and that they should be exposed not to the full market impact of their decisions, but have sufficient exposure to send appropriately strong financial signals to ensure that they minimise adverse market impact.

6.5 National Electricity Market Management Company Limited (NEMMCO)

NEMMCO responded quite extensively to SKM's request for information, and two meetings were held to pursue issues emerging from the ACCC proposal to implement a TNSP Service Standards scheme.

The primary thrust of NEMMCO's position on the matter was that the functions and responsibilities of the TNSP's in the National Electricity Market should be considered to be in a state of evolution, and that any performance measures that are established needed to recognise the possibility of a changing role for the TNSP's.

NEMMCO responded in part to our enquiries as follows:

"NEMMCO is of the view that significant progress in assessing performance cannot be made unless the role of networks is clarified as a first step. This would be a pre-condition for setting performance standards against the role, and then resolving a range of other issues, ….."

and,

"In the course of its daily operational activities, NEMMCO has observed the effect of network outages on the market and notes that some of these impacts arise as a result of different standards and TNSP operating practice being applied."

In exploring some of the "market impact" issues of TNSP performance, NEMMCO have made the following suggestions for consideration as potential performance measures on TNSP's:

- Define service standards for interconnector and intra-regional network capability.
- Service standards could be set to include MW flow capabilities, residue levels for interconnectors, or hours of binding constraint below a defined MW level.
- Where the market incurs a cost as a result of the network capability – eg. ancillary services or directions caused by the network, then the cost should be paid by the network.

In summary, it was NEMMCO's view that performance measures on TNSP's should be trending over time to reflect the market impact of TNSP decision making, but that the current revenue setting for TNSP's did not facilitate this, and insufficient work has yet been done on defining the specific "market impact measures" that could be used.

7. International Market Survey

An international questionnaire was developed and use to collect information and data from a range of transmission companies, in order to gain an appreciation of how performance is measured and service standards are monitored in overseas markets.

The participating TNSP's were

New Zealand	❑ Transpower
United Kingdom	❑ National Grid ❑ Scottish and Southern Energy
United States	❑ California Independent System Operator (CAISO) ❑ Idaho Power ❑ Montana Power ❑ San Diego Gas and Electric ❑ Southern California Edison

7.1 Summary of Measures Used

The following table summarises the type of measures used by the participating companies in international markets:

Market	Type of Measures	Primary Focus
New Zealand	To be advised	To be advised
United Kingdom	System, multiple connection and individual connection point measures covering: ❑ Circuit availability ❑ Quality of supply ❑ Unplanned outages ❑ Planned outages ❑ Constraint and outage costs ❑ Interconnector availability	❑ Overall system performance ❑ Existing incentive scheme based on cost target set by market regulator
United States	❑ Circuit availability ❑ Unplanned outage ❑ Outage costs	❑ Availability of assets with concentration on maintenance and maintenance practices ❑ No existing incentive scheme due to long lead time in establishing quality of maintenance systems

7.2 New Zealand

7.2.1 Transpower

Transpower is the national transmission company for both the North and South Island in New Zealand, and owns and operates a network of 66 kV, 110 kV and 220 kV transmission lines. In addition to being the asset owner / operator, Transpower is also the system operator, responsible for the economic scheduling and dispatch of generation, as well as the planning and co-ordination of transmission outages.

Up until recently, there has been a regime of "light handed regulation", which required a high level of industry self management, reporting and accountability.

As a result of reforms implemented by the New Zealand government in 2000 and 2001, a new Electricity Governance Establishment Committee (EGEC) has been formed, as a predecessor of the soon to be formed Electricity Governance Board (EGB). The ECGC has established a number of working groups, one of which, the Transport Working Group, has been charged with the responsibility of developing proposed new Service Definitions, Measures and Levels to be applied to Transpower. This is to be done in consultation and agreement with customers.

The Minister of Energy has directed that the industry finalise the Service Definitions by October 2002. Transpower sought submissions on the draft Service Definitions by 15 November 2001, and published a "Transmission Service Definition Proposal" in December 2001. A sub-committee of the Transport Working Group assigned to review and report on the proposed definitions is due to report to the Transport Working Group in the next couple of months.

The service measures proposed by the Transport Working Group sub-committee are:

Category	Possible Measures
Capacity – maximum rate of energy transfer in MW	❑ Design fault level ❑ Information & communication about capacity ❑ MW at a given power factor ❑ MVA at a minimum power factor of 0.95
Availability of supply – security	❑ Responsiveness to specified contingency – time to initiate ❑ Responsiveness to specified contingency – time to move to secure state ❑ Level of redundancy ❑ Information & communication about security ❑ Planned outages (grid assets) ❑ Unplanned outages (grid assets)
Availability of supply – reliability	❑ Interruption to services • duration • frequency • magnitude ❑ Load reduction ❑ Generation constraints (system protection) ❑ Unserved energy at point of service

	❑ Information & communication about reliability
Power Quality	❑ Steady state voltage range ❑ Responding to complaint regarding voltage quality ❑ Step voltage changes ❑ Minimum fault duty ❑ Flicker ❑ Harmonics ❑ Voltage inbalance
Information	❑ Operational communication measures ❑ Frequency & timeliness of Service Level reports ❑ Communication measures based on agreed customer targets
Metering	❑ Compliance of metering installation with Maria or other standards ❑ Incidence of non-compliance – maintenance ❑ Incidence of non-compliance – certification

It is evident that the historical trend to "light handed regulation" in the NZ market, combined with the most recent structural reforms to the industry in New Zealand, does not provide any particular insights into innovative schemes or performance measures for Transmission Network Service Providers.

Transpower have provided information about the performance measures that they use for their own internal management purposes, together with 5 years of historical performance data against these measures (refer Appendices F and G).

7.3 United Kingdom

The market in the United Kingdom is regulated by the Office of Gas and Electricity Markets (Ofgem) that licences and monitors the gas and electricity companies, taking action where necessary to ensure compliance. Their main tasks include:

- promotion of competition in all parts of the gas and electricity industries by creating the conditions which allow companies to compete fairly and which enable customers to make an informed choice between suppliers; and
- regulation of areas of the gas and electricity industries where competition is not effective by setting price controls and standards to ensure customers get value for money and a reliable service.

Licensees who operate transmission systems are required to report annually to the regulator on their performance in maintaining system security, availability and quality of service. Since 1991, Ofgem has produced an annual report in which information from all licensees in Great Britain has been consolidated in a single report with commentary on emerging trends. Early work on the Ofgem Information and Incentive Project (IIP) showed inconsistencies in the calculation of measures and reporting of incidents. Subsequently, definitions and reporting arrangements were introduced in April 2001, with the intention that future data submitted will be audited.

The current Ofgem incentive scheme under which NGC operates is due to end on 31 March 2002. Presently, NGC are given a specific target, and are allowed to retain a proportion of the savings if they reduce balancing costs below that target. The remainder is passed back to the industry. Conversely, if NGC's balancing costs go beyond the target, they are charged a proportion of the higher costs.

Under the revised scheme, NGC will be set a single cost target of £460M for one year, rather than the deadband of £481M to £511M that is currently in place. Compared with the present scheme, the company stands to gain greater financial rewards if it reduces its costs below the target, but faces greater losses if the costs are higher than the target. To ensure the scheme is based on accurate and consistent information, Ofgem has published a set of Regulatory Instructions and Guidance manual including definitions for measures.

A copy of the final proposal for the NGC system operator incentive scheme is available on the Ofgem website www.ofgem.gov.uk.

7.3.1 National Grid Company

National Grid Company (NGC) owns, maintains and operates the high voltage electricity network in England and Wales. The company owns and operates the high voltage 275kV and 400kV electricity transmission system and provides services to customers including:

- Generators;
- Interconnected parties;
- Regional electricity companies; and
- Directly-connected customers

National Grid operates 2 interconnectors in Europe:

- The England-France Interconnector is a 2000MW high voltage direct current (HVDC) link between Continental Europe and UK transmission systems with ownership shared between National Grid and Réseau de Transport d'Electricité (RTE). The UK landing point is at Baker's Gap, near Folkestone where the interconnector is cabled underground to Sellindge converter station and connected to the transmission system. The interconnector is approximately 70km in length with 45km of undersea cable. The availability has consistently exceeded 97% per year. From 1 April 2001, the UK-France Interconnector has been made available to third parties through competitive bidding processes.
- The Anglo-Scottish Interconnector is jointly owned by National Grid, Scottish Power and Scottish and Southern Energy. The interconnector has a nominal (planning) capacity of 1200MW and is in the process of being upgraded to 2200MW. The average level of transfers is approximately 10.5TWh per annum and availability has exceeded 95% for the last three years. The British Grid Systems Agreement (BGSA) provides a contractual framework within which National Grid and the two Scottish grid operators agree to share responsibility for the technical issues associated with interconnecting their respective transmission systems. The BGSA has recently undergone a detailed review within the context of the development of the New Electricity Trading Arrangements (NETA).

The performance measures used and results achieved by National Grid are shown in Appendices F and G.

7.3.2 Scottish and Southern Energy

Scottish and Southern Energy (SSE) is an electricity transmission business which owns and operates the high voltage 132kV and 275kV transmission system in the north of Scotland. The system is used to transmit power in bulk from a range of generation sources, including hydro power stations, windfarms and thermal plant. It also operates the high voltage interconnection with ScottishPower over which energy is traded for onward transmission to the energy markets in England and Wales.

The performance measures used and results achieved by Scottish and Southern Energy are shown in Appendices F and G.

7.4 United States

The structure of the US market is different to that in Australia and the UK, with the federal regulator (FERC) not directly involved in the supervising and controlling of electricity markets across the country.

The Federal Energy Regulatory Commission (FERC) is an independent regulatory agency within the Department of Energy that:

- regulates the transmission and sale of natural gas for resale in interstate commerce;
- regulates the transmission of oil by pipeline in interstate commerce;
- regulates the transmission and wholesale sales of electricity in interstate commerce;
- licenses and inspects private, municipal and state hydroelectric projects;
- oversees environmental matters related to natural gas, oil, electricity and hydroelectric projects;
- administers accounting and financial reporting regulations and conduct of jurisdictional companies, and;
- approves site choices as well as abandonment of interstate pipeline facilities.

Any service standards that may be imposed on transmission owners are established and monitored by the individual market operators across the United States. This has lead to different systems being in place, with the Californian market concentrating on asset availability, whilst the Pennyslvania / New Jersey / Maryland (PJM Interconnection) market includes transmission service requests, transmission outage requests, transmission constraint and spinning reserve activation amongst the transmission statistics published in their Operations Report. A review of PJM Interconnection's website has as yet failed to find any reward or penalty scheme based on these or other measures.

7.4.1 California Independent System Operator (CAISO)

CAISO controls 75 percent of California's power grid, transmission systems formerly operated by the three investor-owned utilities in the state.

In late 1997, the California Legislature passed Section 348 of the Assembly Bill 1890 relating to the need for mandatory maintenance standards. Section 348 required the

CAISO to establish standards that regulate inspection, maintenance, repair and replacement for transmission facilities under its control. These ISO Maintenance Standards are either performance or prescriptive, or both, as appropriate to ensure high quality, safe and reliable service. In establishing these standards, the CAISO considered:

- cost;
- local geography and weather;
- applicable codes;
- national electric industry practices;
- sound engineering judgement; and
- experience

An advisory Maintenance Coordination Committee (MCC) was established to periodically convey information to and seek input from Participating Transmission Owners (PTO) and interested stakeholders regarding ISO Maintenance Standards, and make recommendations with respect to proposed amendments and revisions of the ISO Maintenance Standards. These standards are intended to be as flexible as possible to allow for the implementation of new technologies whilst providing a means of measuring availability through monitoring maintenance effectiveness.

The CAISO Maintenance standards are based on the essential elements, with the primary emphasis being on PTO asset availability under CAISO operational control. These elements are:

1) A performance based availability measure determined by a statistical calculation of the duration and frequency of forced outages. The benchmark is set using data from the past 11 years. However, given the focus of the CAISO standards is on maintenance, poor maintenance procedures may not adversely effect availability for a number of years, and so there is a requirement for the PTOs to submit a description of their maintenance practices for review.
2) The CAISO Maintenance Standards specify that PTOs are to submit descriptions of their maintenance practices in a set format, to ensure that sufficient detail is available to assess their adequacy and reasonableness. This assessment decides whether or not adequate maintenance is being done in the short term.
3) The Standards stipulate a Standardised Maintenance Reporting System (SMRS) which allows the CAISO to analyse maintenance data and collaborate with PTOs on potential improvements.

Ultimately, the Standards will include a fourth element to allow for rewards and penalties based on performance against a PTO specific benchmark. These will be intended to promote maintenance practices that result in improved asset availability.

The California model is almost entirely focused on asset availability and associated maintenance, and as such will have a long lead time before it will be able to apply any incentive scheme. It contains no provision for consideration of market effects due to forced outages, or transmission constraints between the different counties in the CAISO control region.

Whilst being most instructive in establishing, reviewing and reporting maintenance standards, it is not compatible with a short term incentive scheme model for the service standards sought for the Australian TNSPs.

The performance measures used and results achieved by CAISO are shown in Appendices F and G.

7.4.2 Idaho Power

Idaho Power and unregulated Ida-West Energy are subsidiaries of IDACORP Inc. It is a regulated investor-owned utility with over $2.5 billion in assets, providing electricity to over 390,000 customers in 83 cities in a service territory covering southern Idaho, eastern Oregon and northern Nevada. The company owns and operates 17 hydroelectric plants on the Snake River and its tributaries. It also owns interests in 3 coal fired generating stations.

Idaho Power responds to the Idaho Public Utilities Commission regarding proposed rate increases for residential and commercial customers.

However, Idaho Power is currently not subject to any incentive or penalty scheme, and was not prepared to offer any further information relating to performance measures recorded for either internal or regulatory use.

The performance measures used and results achieved by Idaho Power are shown in Appendices F and G.

7.4.3 Montana Power

Montana Power provides regulated electric and natural gas transmission and distribution services to 295,000 electric customers and 156,000 natural gas customers in the western two-thirds of Montana. Montana Power's electric transmission system consists of over 7,000 miles of transmission lines and associated terminal facilities with voltage levels ranging from 69 kV to 500 kV. Beginning in July of 2002, Montana Power will become the default supplier as the state of Montana transitions to a deregulated customer choice environment in 2007.

The Montana Power system has interconnections to five major transmission systems located in the Western Systems Coordinating Council (WSCC) area, as well as one interconnection to a system that connects with the Mid-Continent Area Power Pool (MAPP) region. With these interconnections, Montana Power's electric transmission system provides for the purchase and delivery of power in markets from the Pacific Northwest, to the desert Southwest and California, to the Colorado area and to the MAPP region.

Montana Power is not subject to any reward / penalty scheme, and uses a single internal measure called Transmission Availability Composite Score. This score is combined with a circuit importance score (a forced ranking of the importance of each circuit in the range 1 to 4), the number of customers served by each circuit and the circuit condition to prioritise maintenance and capital expenditure.

The performance measures used and results achieved by Montana Power are shown in Appendices F and G.

7.4.4 San Diego Gas & Electric

San Diego Gas & Electric (SDGE) is a regulated transmission and distribution utility providing electric service to three million customers in San Diego and southern Orange counties and natural gas service to San Diego County.

With a maximum demand of 4000 MW, their system operates between 69 kV and 500 kV, and has approximately 2,800 km of transmission lines.

SDGE is subject to the regulatory provisions of the CAISO, and with the introduction of the ISO Maintenance Standards, has maintained transmission availability indices (annual average interruption duration of lines with outages, proportion of lines out and average frequency of outages) since 1998. Distribution indices have been used for both internal and regulatory reporting since 1996.

SDGE also report both internally and to the CAISO on the cost of transmission outages. However, as found with other US companies, their performance data was considered confidential and was not included in their submission.

The performance measures used and results achieved by San Diego Gas and Electric are shown in Appendices F and G.

7.4.5 Southern California Edison

Southern California Edison (SCE) is California's second largest investor-owned electric utility company and supplies power to 4.3 customers in a 50,000-square-mile service area within central, coastal and Southern California. This includes Los Angeles and surrounding counties, and San Bernadino county.

In 1997, as part of the restructuring of the electric industry in California, SCE sold its 12 fossil fuel generating stations and overhauled nearly every aspect of its business. However SCE continue to own and operate separate hydro and nuclear power facilities – SONGS and Big Creek. The San Onofre Nuclear Generating Station (SONGS) is a jointly owned enterprise among SCE (75% ownership), San Diego Gas & Electric (20%), and the cities of Riverside and Anaheim. SCE was not prepared to offer any details relating to the Big Creek hydroelectric plant for security reasons.

SCE is under the control of the CAISO, and as such subject to the ISO Maintenance Standards. The performance measures reported to the ISO are not currently subject to rewards or penalties, however tariffs and agreements include provisions for rewards or penalties if performance falls outside of target ranges. A number of market related measures (cost of outages, potential cost benefits from rescheduling and cost of additional energy to overcome network constraints) are recorded for internal planning of maintenance outages but not tracked as a regulatory measure.

The performance measures used and results achieved by Southern California Edison are shown in Appendices F and G.

8. SKM Recommended Service Level Measures

There is general consensus on the part of TNSP's, and the majority of other stakeholders, that it is appropriate for the ACCC to put an incentive/penalty based performance scheme in place to monitor the performance of TNSP's.

There is not general consensus however as to the nature of the measures to the used, and the emphasis to be placed on each measure.

While it makes sense to establish a common set of measures, with consistent definitions and criteria for measurement, differences in state based regulatory regimes, industry structure, and the differing roles of the transmission networks makes the application of a universal set of performance measures impractical.

8.1 Proposed Initial Measures

After consideration of all of the information, issues, trade-offs, and views put forward by TNSPs, market participants, regulators and other interested parties, Sinclair Knight Merz recommends the following suite of Service Level Measures for initial use by the ACCC in monitoring and recognising the service standards of TNSPs. The definitions of these measures are included in Appendix B.

Measure 1 – Transmission Circuit Availability

- Disaggregated into:

  a) Critical circuits
  b) Non-critical circuits
  c) Peak load periods
  d) Non-peak load periods

  This measure has been selected for the following reasons:

  - It generally meets the high level principles (clause 6.1)
  - The disaggregation provides increased sensitivity to the impact that outages will have on critical circuits, including interconnectors, at times of peak loads
  - It is common use both in Australia and internationally

Measure 2 – System Minutes Lost

- The cumulative effect of "energy not supplied" as a result of outages from all causes (planned and unplanned).
- Annual target "overruns" and "underruns" to be "banked" to reflect underlying reliability trend, not just annual results.

  This measure has been selected for the following reasons:

  - It generally meets the high level principles (clause 6.1)
  - It is a direct measure of "customer impact"

- While it can be impacted by circumstances outside of TNSP's reasonable control (eg weather), the effects of such impact can be mitigated by statistical techniques
- It is reasonably commonly used both in Australia and internationally

Measure 3 – Average Outage Duration

- Average restoration time for all unplanned outages.

  This measure has been selected for the following reasons:

  - It generally meets the high level principles (clause 6.1)
  - It is a direct measure of the responsiveness of TNSPs to restore supply after an unplanned interruption
  - It is reasonably widely used as a measure both in Australia and internationally

Measure 4 – Transmission Constraints (Intra-regional)

- Number of hours per annum of binding intra-regional constraints

  This measure has been selected for the following reasons:

  - It generally meets the high level principles (clause 6.1)
  - It is a measure which reflects the impact of transmission system unavailability on economic dispatch of generation within a region
  - It is a measure which captures an event likely to have an impact on market performance and cost to customers

Measure 5 – Transmission Constraints (Inter-regional)

- Number of hours per annum of binding inter-regional constraints

  This measure has been selected for the following reasons:

  - It generally meets the high level principles (clause 6.1)
  - It is a measure which has a direct and significant impact on market performance and inter-regional market price separation

We submit that these measures represent a balanced mix of system related performance measures, and simulated market impact measures, while not directly exposing the TNSP's to the full volatility of market impacts during periods of transmission outages, or transmission constraints.

The measures proposed are generally accepted, well known measures and have credibility within the electricity supply industry. The measures also have a statistical soundness, in the sense that they are within the reasonable control or ability of the TNSP to influence the results achieved.

While there are certain factors, not totally within the control of the TNSP, that influence the results in any one year, such as the impact that the level of capital and refurbishment works has on circuit availability, it is within the control of the TNSP to

adopt project planning and implementation strategies which will mitigate the impact (eg. live line work, timing of outages, deployment of resources, etc).

It is recognised that the variability of climatic events does have an impact on measures such as system minutes lost, but the effects of this on any incentive/penalty scheme can be mitigated by monitoring underlying trends over time, rather than responding to individual annual results against targets.

8.2 Applicability of Initial Measures

The suite of measures shown above, while being to a standard set of definitions and uniform data collection criteria, can be applied flexibly to different TNSPs where the full range of performance measures is inappropriate, or irrelevant (eg. EnergyAustralia, SMHEA). Appendix C indicates the applicability of each of the nominated measures and sub-measures, to each of the TNSPs.

As can be seen, it is inappropriate or irrelevant to apply all measures to all TNSPs. In the case of EnergyAustralia, none of their transmission circuits impact on the operations of the NEM, and a segregation into critical / non-critical or peak / non-peak is irrelevant. A similar comment applies to both "hours constrained" measures.

In the case of SMHEA, they do not have any end-use customers or distributors, and the "minutes off supply" measure is irrelevant. There is currently no interconnector between Tasmania and Victoria, and when Basslink becomes a reality, it is likely to be an unregulated interconnector subject to separate performance contracts, and unlikely to become subject to ACCC regulation.

Consequently, an "x" in the applicability schedule indicates that this measure should not be used in the ACCC TNSP Service Standards incentive scheme for that particular TNSP.

8.3 TNSP Service Standards Implementation Spreadsheet

In order to ensure a consistent and auditable approach to the implementation of the TNSP Service Standards incentive scheme, SKM will provide to the ACCC an implementation spreadsheet for each TNSP being monitored. The design of the spreadsheet is generally as shown in Appendix D.

As can be seen, the spreadsheet makes provision for the proposed initial measures, as well as a number of additional "market impact" measures which may be developed and implemented within the period 2002 to 2006.

After the collection of further data, to a consistent set of definitions, as shown in Appendix B, SKM will populate the "actual" and "target" columns, and will make recommendations regarding the ramping factors, impact factors and collars and caps to be applied to each measure.

In developing the Service Standards implementation spreadsheet, SKM has given consideration to the need for flexibility in the application of the performance measures as follows:

- Some of the proposed measures may be inappropriate to some TNSPs

- As more work is undertaken to refine and define the "market impact" measures, these can be incorporated
- A particular performance measure may be implemented in year 1 of the program, or may be implemented during any year of the 5 year regulatory period
- If there is concern about the accuracy of data being collected for any new measure, its impact in initial years can be controlled via ramping factors
- If an initial measure is subsequently replaced by a superior measure, it can be "ramped down" as the new measure is "ramped up"
- A series of "impact factors" and "collars and caps" will be developed to reflect the appropriate importance of each measure
- The transparent approach recommended by SKM via the implementation spreadsheet will enable the ACCC, with the agreement of the TNSPs, to enhance and change the TNSP Service Standards incentive scheme to keep pace with the increasing demands of the competitive energy market and the changing role of the TNSPs in that market

8.4 Consideration of other Performance Measures

SKM has reviewed the appropriateness of a wide range of service standard measures as variously adopted and measured by the Australian TNSPs, and a variety of international companies from the UK, US and New Zealand.

In addition, we have considered the possibility and appropriateness of several "market impact" measures specifically designed to monitor the impact of TNSP performance on the Australian National Electricity Market.

Consideration has also been given to the incorporation of administrative and business communication service standards such as:

- The accuracy and timeliness of information and data submissions by the TNSPs to the ACCC; and
- The timeliness and appropriateness of TNSP responses to written requests for electricity connections, project costing information and other enquiries from customers and other users of the transmission networks under their control.

While these administrative and business communication issues are extremely important in terms of establishing an open and transparent regulatory regime, we have not at this stage recommended their adoption within the TNSP Service Standards framework.

8.5 Next Steps

As the collection of TNSP performance data carried out in Stage 1 of this assignment has revealed that TNSPs do not all report on the same measures to the same definitions, it will be necessary to conduct a further round of data collection in order to populate the implementation spreadsheets with consistent and accurate data.

Appendix A Terms of Reference of ACCC Consultancy

Consultancy Terms of Reference

Regulatory Service Standards Review

Background

On 27 May 1999, the Australian Competition and Consumer Commission (Commission), released its draft Statement of Regulatory Principles for the Regulation of Transmission Revenues *(Draft Regulatory Principles)*.

The *Draft Regulatory Principles* outlines the Commission's initial views on service standards that it would impose on Transmission Network Service Providers (TNSPs). The Commission now intends to further develop these service standards, undertaking a regulatory service standards review.

The review will need to:

- review existing transmission network service standards;
- review the appropriateness of the service standards proposed in the Annex 8.1 Draft Regulatory Principles and recent regulatory decisions;
- analyse and report on international service standards;
- develop appropriate service standards and bench marks to apply;
  - across the National Electricity market (NEM); and
  - for each transmission network;

  including market based service standards; incorporating existing statutory requirements; and
- assess the viability of financial service incentives, which involves consideration of the possible forms that such incentives may take.

The Commission will also require that the consultant's team consist of at least one mathematician, to verify the statistical soundness of the measures developed.

Terms of Reference

1. The consultant is to carry out a review of existing transmission network service standards and assess the appropriateness of the service standards outlined in Annex 8.1 of the *Draft Regulatory Principles*.

2. The consultant is required to consider existing studies being undertaken by the National Electricity Code Administrator (NECA) the joint jurisdictional regulators' Steering Committee on National Reporting Requirements, (mindful of the differences between distribution and transmission businesses).

3. The consultant must analyse and report on transmission network service standards and market based practices used internationally. Particularly those used in the US, UK and NZ, and advise on the applicability of the use of such service standards within the NEM The consultant should also comment on the soundness of the

indicators, ie whether changes in the measured indicators actually represent a change in service standards.

4. Based on the assessment of the appropriateness of existing service standards, those proposed in the Annex 8.1 of the Draft Regulatory Principles, recent regulatory decisions and the international analysis, the consultant is to propose a set of service standards and benchmarks suitable for regulatory purposes. This set of service standards should combine general measures to be applied across the NEM and specific measures for each individual TNSP, incorporating jurisdictional specific safety, environmental and reliability obligations.

5. The consultant should also advise on performance indicators for interconnector availability and market-based outcomes. This should be undertaken in consideration of the NECA review into the scope for integrating the energy market and network services. Advise on the impact of other market participants on these market-based outcomes.

6. In developing the service standards, the consultant is required to identify current statutory obligations imposed by licencing authorities on the transmission networks and incorporate these into the service standards. The consultant must also consider current reporting requirement associated with service standards in developing reporting guidelines.

7. The consultant must develop options for providing appropriate commercial incentives for TNSPs to meet agreed service standards. Focus should be on adjustments to the regulatory revenue cap equation developed for each TNSP at the revenue reset carried out in accordance with Chapter 6 of the Code.

Timing and Outcomes

The draft consultancy report must be provided to the Commission no later than 30 January 2002 and the final report no later than 30 March 2002.

The draft report will be distributed to State regulators and TNSPs. The consultant would be expected to enter into discussion with interested parties through out the consultancy. The consultant may also expect to make a presentation on the draft report if required by the Commission.

The final report will be made available to the public. It will also form the basis of discussions to be held with key stakeholders, which is expected to take place March 2002. The consultant should be available for this discussion.

The consultant should also expect to make one or more presentations to staff of the Commission and to each of the transmission networks regarding the contents of the report.

Appendix B TNSP – Service Level Measures

1) Transmission Circuit Availability
2) System Minutes Lost
3) Average Outage Duration
4) Transmission Constraints (Intra-regional)
5) Transmission Constraints (Inter-regional)

Measure 1 – Transmission Circuit Availability

	Transmission Circuit Availability
Sub-measures	☐ Transmission circuit availability (critical circuits) ☐ Transmission circuit availability (non-critical circuits) ☐ Transmission circuit availability (peak periods) ☐ Transmission circuit availability (off-peak periods)
Unit of Measure	% of total possible hours available.
Source of Data	☐ TNSP outage reports and system for circuit availability ☐ Agreed Schedule of Critical Circuits ☐ Nominated peak / off-peak hours — — — ☐ May include intermediate time periods and seasonal periods
Definition/Formula	Formula: No hours pa defined (critical / non-critical) circuits are available x 100 Total possible no of defined circuit hours Definition: The actual circuit hours available for defined (critical/non-critical) transmission circuits divided by the total possible defined circuit hours available. Note that there shall be an annual review of the nominated list of critical circuits / system components
Exclusions	☐ Exclude from "circuit unavailability" any outages shown to be caused by a fault or other event on a "3rd party system" eg. intertrip signal, generator outage, customer installation (TNSP to provide list) ☐ Force majure events
Inclusions	☐ "Circuits" includes overhead lines, underground cables, power transformers, phase shifting transformers, static var compensators, capacitor banks, and any other primary transmission equipment essential for the successful operation of the transmission system (TNSP to provide lists) ☐ Circuit "unavailability" to include outages from all causes including planned, forced and emergency events, including extreme events

Measure 2 – System Minutes Lost

	System Minutes Off Supply
Type of Target Proposed	Single Annual Target (banking of overruns and underruns)
Unit of Measure	Minutes (system equivalent)
Source of Data	☐ TNSP Outage Reporting System ☐ TNSP Metering Data (maximum demand)
Definition/Formula	Formula: $\frac{\text{Undelivered energy (MWh) as a result of transmission outages} \times 60}{\text{System Maximum Demand (MW)}}$ Definition: This is an estimate of the MWh unsupplied divided by the highest previously recorded maximum demand delivered by the transmission system.
Exclusions	☐ Planned outages for construction, connection, augmentation, and maintenance works ☐ Energy not supplied, or load shedding resulting from generation shortages ☐ Upstream network effects (eg. generator) ☐ Downstream network events (eg. customer / distributor) ☐ Force majure events
Inclusions	☐ Estimate of "undelivered energy" shall include a projection of kWh lost that reflects expected load profile during the outage ☐ Includes all energy not supplied as a result of forced and unplanned outages ☐ Includes all sustained (>1 min) fault outages, regardless of severity ☐ Includes outages on all parts of the transmission system including connection assets and interconnected system

Measure 3 – Average Outage Duration

Measure	Average Outage Restoration Time
Unit of Measure	Minutes
Source of Data	TNSP Outage Reporting System
Definition/Formula	Formula: $\frac{\text{Aggregate minutes duration of all unplanned outages}}{\text{No of events}}$ Definition: The cumulative summation of the outage duration time for the period, divided by the number of outage events during the period
Exclusions	☐ Planned outages ☐ Excludes momentary interruptions (< 1 min) ☐ Force majure events
Inclusions	☐ Includes faults on all parts of the transmission system (connection assets, interconnected system assets) ☐ Includes all forced and fault outages whether or not loss of supply occurs

Measure 4 – Transmission Constraints (Intra-regional)

Measure	Hours of Binding Constraints – Inter-regional
Unit of Measure	Hours per annum
Source of Data	NEMMCO
Definition/Formula	Formula: Aggregate number of hours per annum that binding constraints exist on any part of the interconnected transmission system within a region (excludes interconnectors)
Exclusions	☐ Hours of binding constraints at or near nominal capacity ☐ Excludes connection assets ☐ Hours of binding constraints where non-credible generation contingencies coincide with previously notified planned outages ☐ Force majure events
Inclusions	☐ Includes binding constraints from all causes including planned, forced and emergency events, including extreme events

Measure 5 – Transmission Constraints (Inter-regional)

Measure	Hours of Binding Constraints – Inter-regional
Unit of Measure	Hours per annum
Source of Data	NEMMCO
Definition/Formula	Formula: Aggregate number of hours per annum that binding constraints exist on a inter-regional interconnector. Hours of binding constraints to be accumulated against "importing" TNSP.
Exclusions	☐ Hours of binding constraints at or near nominal capacity ☐ Hours of binding constraints where non-credible generation contingencies coincide with previously notified planned outages ☐ Any event which was clearly as a consequence of action or inaction of another TNSP ☐ Force majure events
Inclusions	☐ Events where binding constraints occur due to unavailability of interconnector support assets ☐ Includes binding constraints from all causes including planned, forced and emergency events, including extreme events

Appendix C Applicability Schedule

ACCC TNSP Service Standards
Services Standards Applicability Schedule

Service Standards Measure	ElectraNet SA	Energy Australia	Powerlink	SMHEA	SPI PowerNet / VENCorp	Transend	TransGrid
Circuit Availability	✓	✓	✓	✓	✓	✓	✓
- Critical	✓	×	✓	✓	✓	✓	✓
- Non-critical	✓	×	✓	✓	✓	✓	✓
- Peak	✓	×	✓	✓	✓	✓	✓
- Non-peak	✓	×	✓	✓	✓	✓	✓
Minutes off Supply	✓	✓	✓	×	✓	✓	✓
Average Restoration Period (unplanned)	✓	✓	✓	✓	✓	✓	✓
Hours Constrained pa. - Intra-Regional	✓	×	✓	✓	✓	✓	✓
Hours Constrained pa. - Interconnector (Importer)	✓	×	✓	✓	✓	×	✓

Appendix D Implementation Spreadsheet

Sample Service Standards Implementation Spreadsheet

Revenue at Risk / Incentive $ - (Note 1)

Service Standard (Note 2)	Actual (Note 3)			Target (Note 4)					Performance Result (Note 5)					Ramping Factors (Note 6)					Impact Factor (Note 7)	Bonus / Penalty Cap (Note 8)	Bonus / Penalty (Note 9)				
	1999	2000	2001	2002	2003	2004	2005	2006	2002	2003	2004	2005	2006	2002	2003	2004	2005	2006			2002	2003	2004	2005	2006
Circuit Availability														1.0	1.0	1.0	1.0	1.0							
~ critical																									
~ non-critical																									
~ peak																									
~ off-peak																									
Minutes Off Supply														1.0	1.0	0.5	0.0	0.0							
Average Restoration Period														1.0	1.0	1.0	1.0	1.0							
Hours Constrained - intra regional														0.0	1.0	1.0	1.0	1.0							
Hours Constrained - interconnectors														0.0	1.0	1.0	1.0	1.0							
Market Measure 1																									
Market Measure 2																									
Market Measure 3																									
TOTAL																			0.0%	$ -	$ -	$ -	$ -	$ -	$ -

Explanatory Notes

1. SKM will provide a full Service Standard Implementation spreadsheet, complete with all necessary calculation formulae, for each individual TNSP. SKM will recommend a level of Risk / Incentive for each TNSP.
2. The spreadsheet will list the initial Service Standards agreed upon, together with provision for a number of "market measures" (as yet undefined) that may be implemented during the 5 year period.
3. SKM will populate the data in the first 3 columns from the refined data, to standard definitions, to be collected in Stage 2.
4. SKM will populate the target columns with recommended performance targets for 2002 to 2006. These targets will be set based on the "3 year average" (1999 to 2001) provided these 3 years are representative. The targets set will provide for a balanced probability of the targets either being exceeded, or not exceeded, with a symmetrical approach to rewards / penalties.
5. As actual results become progressively known, ACCC can populate these columns with data. The spreadsheet will automatically generate bonus / penalty payments, based on these results, and other pre-set parameters in the spreadsheets.
6. SKM will recommend a set of ramping factors, based on an initial "best assessment" of the likely rate of transition from initial performance measures to new market impact measures. The ramping factors can be adjusted by the ACCC in future if the transition follows a different timetable to that expected.
7. SKM will recommend and populate the Impact Factor. This factor essentially weights the relative importance of the various measures, and when combined with the Ramping Factor, determines the impact of the measure. The Impact Factors will always total 100%.
8. The Bonus / Penalty Cap is a cap on the impact that any one measure can have on the total bonus or penalty. It will be set to limit the impact of extreme events, but not to the extent that it erodes the incentive for changed TNSP behaviour.
9. The final bonus or penalty payment per annum per measure will be automatically calculated from all of the preceding data. SKM will undertake a sanity check on dummy results to ensure credible results with appropriate strength of the financial incentive to maintain or improve performance.

Appendix E Questionnaires

SINCLAIR KNIGHT MERZ

FILE NOTE

Date: 10 December 2001
Project No: QM43502

ACCC – TNSP Service Standards
Survey Questionnaire

Sinclair Knight Merz has been engaged by the Australian Competition and Consumer Commission (ACCC) to develop a set of service standards for Transmission Network Service Providers (TNSP's) operating in the Australian National Electricity Market (NEM).

The companies concerned are:

- ElectraNet SA (South Australia);
- EnergyAustralia (NSW)
- Powerlink (Queensland);
- Snowy Mountains Hydro Electricity Authority (SMHEA);
- SPI PowerNet (Victoria);
- Transend (Tasmania); and
- TransGrid (NSW).

A project briefing session was held at the ACCC offices in Canberra on Monday 3 December 2001, at which the views and opinions of the TNSP representatives were sought regarding the project. This survey questionnaire is designed to obtain information about the existing system performance monitoring systems and data available within the TNSP's, or reported to the existing State based regulators.

In order that this information is collected and recorded in a consistent format, we have prepared this survey questionnaire to enable ease in the completion of the questions and consistency in the evaluation of the responses.

Could you please arrange for the completion of the survey questionnaire and the associated historical performance spreadsheet by **Monday 7 January 2002**. Should you have any questions or points of clarification about the questionnaire, or difficulties with the due date, please email them to Cliff Jones at cjones@skm.com.au. Responses to all questions will be relayed to all TNSP representatives so that a consistent understanding will be ensured.

SINCLAIR KNIGHT MERZ

Subject: Survey Questionnaire
Project No: QM43502

Survey Questions

It is recognised that terms and definitions will vary from country to country, and that different companies may monitor system performance using different measures. However, this is the very issue this survey is attempting to explore. Please complete as many of the questions as possible. Where available, please provide actual data for the most recent calendar or financial year, or provide estimated figures or results if necessary. Where a figure provided is an estimate, please indicate by ticking the box marked "EST".

A. Organisation details

Q1.	Company Name		
Q2.	Location (State / Country)		
Q3.	Company Contact Person		
Q4.	Contact details: Telephone		
	Fax		
	Email		

B. Transmission System details

Q5.	System Voltages of Transmission Assets[1]		kV		kV
			kV		kV
Q6.	System Maximum Demand		MW	EST ☐	
Q7.	Energy delivered through transmission system		GWh	EST ☐	
Q8.	Regulated Network revenue for transmission assets			EST ☐	

[1] 220 kV and above, between 66 and 220 kV operating in parallel and providing support to the transmission network or between 66 and 220 kV and deemed by the regulator to be part of the transmission network.

SINCLAIR KNIGHT MERZ

Subject: Survey Questionnaire
Project No: QM43502

Q9. Circuit lengths of transmission lines

		Overhead	Underground
☐	kV	☐ km	☐ km
☐	kV	☐ km	☐ km
☐	kV	☐ km	☐ km
☐	kV	☐ km	☐ km

Q10. Please indicate below the system performance measures used by your company, and / or reported to your regulatory body, to monitor the service levels of the transmission system.

No	Measure	Unit of Measure	Company Measure		Regulatory Measure	
			Yes	No	Yes	No
	System					
1	System Average Interruption Duration Index (SAIDI)	Minutes pa				
2	System Average Interruption Frequency Index (SAIFI)	Number pa				
3	Customer Average Interruption Duration Index (System) (CAIDI)	Minutes pa				
4	Interruption - energy not supplied	MWh				
5	Transmission circuit availability	%				
6	Annual total of sustained under / over voltage excursions	Number pa				
7	Annual total of excessive transient voltage excursions	Number pa				
	For Multiple Connection Points					
8	Annual total of unplanned outages	Number pa				
9	Annual total of unplanned outages causing loss of supply	Number pa				
10	Energy not supplied during outage	MWh				
11	Maximum load lost during outage	MW				
12	Outage duration	Minutes pa				
	For Individual Connection Points					
13	Customer Average Interruption Duration Index (CAIDI)	Minutes pa				
14	Customer maximum interruption duration	Minutes				
15	Customer minimum interruption duration	Minutes				
16	Customer average interruption frequency	Number pa				
17	Average restoration time	Minutes				
18	Annual total of unplanned outages	Minutes				

SINCLAIR KNIGHT MERZ

Subject: Survey Questionnaire
Project No: QM43502

No	Measure	Unit of Measure	Company Measure		Regulatory Measure	
			Yes	No	Yes	No
19	Annual total of energy not supplied during unplanned outage	MWh				
20	Maximum load lost during unplanned outage	MW				
21	Duration of planned interruptions	Minutes pa				
22	Frequency of planned interruptions	Number pa				
23	Period of notice for planned interruptions	Days				
	Market Related Measures					
24	Cost of transmission outages	$ pa				
25	Potential / actual cost benefits from rescheduling planned outage / improved restoration performance	$				
26	Comparison of potential savings and actual costs of outage from rescheduling planned outage / improved restoration performance	$				
27	Retrospective assessment of actual costs and benefits of augmentation	$				
28	Outcomes from availability incentive scheme (if such a scheme exists)					
29	Annual total of network constraint events	Number				
30	Amount of additional generation to overcome network constraints	MW				
31	Cost of additional energy to overcome network constraints	$				
32	Interconnector and critical circuit availability	%				
	Other					
	< Please specify >					
	< Please specify >					
	< Please specify >					
	< Please specify >					

Q11. For those measures monitored either internally, or for regulatory reporting purposes, please record, where available, performance results for the past five (5) years in the attached spreadsheet.

Q12. Is your company currently subject to any reward / penalty scheme imposed by a regulator for the performance of your transmission system against pre-determined targets ?

YES ☐ NO ☐

If yes, please provide details or attach relevant documents

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Q13. Are there any other matters, or information you are able to provide in relation to performance monitoring of the transmission system operated by your company ?

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SINCLAIR KNIGHT MERZ

Subject: Survey Questionnaire
Project No: QM43502

FILE NOTE

Date: 10 December 2001
Project No: QM43502

ACCC – TNSP Service Standards
General Stakeholders Questionnaire

Sinclair Knight Merz has been engaged by the Australian Competition and Consumer Commission (ACCC) to develop a set of service standards for Transmission Network Service Providers (TNSP's) operating in the Australian National Electricity Market (NEM).

The companies concerned are:

- ElectraNet SA (South Australia);
- EnergyAustralia (NSW)
- Powerlink (Queensland);
- Snowy Mountains Hydro Electricity Authority (SMHEA);
- SPI PowerNet (Victoria);
- Transend (Tasmania); and
- TransGrid (NSW).

As a part of the assignment, the ACCC requires an understanding of current practices and innovative new ideas with respect to setting and monitoring service standards of transmission system owners in the United States, United Kingdom and New Zealand.

In addition, the ACCC is interested in the views of other interested stakeholders in the Australian National Electricity Market including NEMMCO, NECA and State based regulators.

The purpose of this briefing note and questionnaire is to explore the degree to which your organisation is impacted by, or has a view on, the appropriate service standards that should be applied to the transmission networks operated in the National Electricity Market.

In this respect, service standards include, but are not necessarily restricted to, such things as;

- reliability of supply;
- quality of supply;
- energy no supplied;
- frequency of outages;
- duration of outages;
- notice of planned interruptions; and
- impact of transmission outages on market operations.

Could you please arrange for the completion of the survey questionnaire by **Monday 7 January 2002**. Should you have any questions or points of clarification about the questionnaire, or difficulties with the due date, please email them to Cliff Jones at cjones@skm.com.au.

SINCLAIR KNIGHT MERZ

Subject: Survey Questionnaire
Project No: QM43502

Survey Questions

Q1. Is your organisation currently undertaking any reviews / studies / investigations that may impact on the ACCC – TNSP Service Standards assignment ?

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Q2. Does your organisation have any specific regulatory requirements that impact on, or may be impacted by, the service standards of the TNSP's ?

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Q3. Does your organisation have a view on the current level of performance of the transmission systems in Australia ?

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SINCLAIR KNIGHT MERZ

Subject: Survey Questionnaire
Project No: QM43502

Q4. Does your organisation have a view on how the overall performance of the TNSP's and their effective integration into the National Electricity Market (NEM) might be enhanced ?

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Q5. Does your organisation have a view on what are appropriate performance measures that should be applied to TNSP's ?

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Q6. Are there any other issues relevant to the performance of the TNSP's operating in the NEM that you consider are relevant to this assignment ?

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SINCLAIR KNIGHT MERZ

Subject: Survey Questionnaire
Project No: QM43502

FILE NOTE

Date: 10 December 2001
Project No: QM43502

International Survey Questionnaire

Sinclair Knight Merz has been engaged by the Australian Competition and Consumer Commission (ACCC) to develop a set of service standards for Transmission Network Service Providers (TNSP's) operating in the Australian National Electricity Market (NEM). The TNSP's are the companies that own transmission assets (110 kV and above) in each State of Australia that participate in the NEM.

The companies concerned are:

- ElectraNet (South Australia);
- EnergyAustralia (NSW)
- Powerlink (Queensland);
- PowerNet (Victoria);
- Snowy Mountains Hydro Electricity Authority (SMHEA);
- Transend (Tasmania); and
- TransGrid (NSW);

A separate company, National Electricity Market Management Company (NEMMCO), is responsible for the control and operation of the transmission systems, and the National Electricity Market.

As a part of the assignment, ACCC requires an understanding of current practices and any innovative new ideas with respect to setting and monitoring service standards of transmission asset owners in the United States, United Kingdom and New Zealand.

In order that this information is collected and recorded in a consistent format, we have prepared this "International Survey Questionnaire" to enable ease in the completion of the questions and consistency in the evaluation of the responses.

Could you please arrange for the completion of the attached survey questionnaire, to the best extent possible as it applies to your company. Where other company reports or documentation that describes transmission system performance may be available, please provide these separately to the survey.

Survey questionnaires should be completed and returned by **Monday 7 January 2002**.

SINCLAIR KNIGHT MERZ

Subject: Survey Questionnaire
Project No: QM43502

Survey Questions

It is recognised that terms and definitions will vary from country to country, and that different companies may monitor system performance using different measures. However, this is the very issue this survey is attempting to explore. Please complete as many of the questions as possible. Where available, please provide actual data for the most recent calendar or financial year, or provide estimated figures or results if necessary. Where a figure provided is an estimate, please indicate by ticking the box marked "EST".

C. Organisation details

Q1.	Company Name		
Q2.	Location (State / Country)		
Q3.	Company Contact Person		
Q4.	Contact details: Telephone		
	Fax		
	Email		

D. Transmission System details

Q5.	System Voltages of Transmission Assets (100 kV and above)		kV		kV
			kV		kV
Q6.	System Maximum Demand		MW	EST ☐	
Q7.	Energy delivered through transmission system		GWh	EST ☐	
Q8.	Regulated Network revenue for transmission assets			EST ☐	

SINCLAIR KNIGHT MERZ

Subject: Survey Questionnaire
Project No: QM43502

Q9. Circuit lengths of transmission lines

		Overhead	Underground
☐	kV	☐ km	☐ km
☐	kV	☐ km	☐ km
☐	kV	☐ km	☐ km
☐	kV	☐ km	☐ km

Q10. Please indicate below the system performance measures used by your company, and / or reported to your regulatory body, to monitor the service levels of the transmission system.

No	Measure	Unit of Measure	Company Measure		Regulatory Measure	
			Yes	No	Yes	No
	System					
1	System Average Interruption Duration Index (SAIDI)	Minutes pa				
2	System Average Interruption Frequency Index (SAIFI)	Number pa				
3	Customer Average Interruption Duration Index (System) (CAIDI)	Minutes pa				
4	Interruption - energy not supplied	MWh				
5	Transmission circuit availability	%				
6	Annual total of sustained under / over voltage excursions	Number pa				
7	Annual total of excessive transient voltage excursions	Number pa				
	For Multiple Connection Points					
8	Annual total of unplanned outages	Number pa				
9	Annual total of unplanned outages causing loss of supply	Number pa				
10	Energy not supplied during outage	MWh				
11	Maximum load lost during outage	MW				
12	Outage duration	Minutes pa				
	For Individual Connection Points					
13	Customer Average Interruption Duration Index (CAIDI)	Minutes pa				
14	Customer maximum interruption duration	Minutes				
15	Customer minimum interruption duration	Minutes				
16	Customer average interruption frequency	Number pa				
17	Average restoration time	Minutes				
18	Annual total of unplanned outages	Minutes				

SINCLAIR KNIGHT MERZ

Subject: Survey Questionnaire
Project No: QM43502

No	Measure	Unit of Measure	Company Measure		Regulatory Measure	
			Yes	No	Yes	No
19	Annual total of energy not supplied during unplanned outage	MWh				
20	Maximum load lost during unplanned outage	MW				
21	Duration of planned interruptions	Minutes pa				
22	Frequency of planned interruptions	Number pa				
23	Period of notice for planned interruptions	Days				
	Market Related Measures					
24	Cost of transmission outages	$ pa				
25	Potential / actual cost benefits from rescheduling planned outage / improved restoration performance	$				
26	Comparison of potential savings and actual costs of outage from rescheduling planned outage / improved restoration performance	$				
27	Retrospective assessment of actual costs and benefits of augmentation	$				
28	Outcomes from availability incentive scheme (if such a scheme exists)					
29	Annual total of network constraint events	Number				
30	Amount of additional generation to overcome network constraints	MW				
31	Cost of additional energy to overcome network constraints	$				
32	Interconnector and critical circuit availability	%				
	Other					
	< Please specify >					
	< Please specify >					
	< Please specify >					
	< Please specify >					

Q11. For those measures monitored either internally, or for regulatory reporting purposes, please record, where available, performance results for the past five (5) years in the attached spreadsheet.

Q12. Is your company currently subject to any reward / penalty scheme imposed by a regulator for the performance of your transmission system against pre-determined targets ?

YES ☐ NO ☐

If yes, please provide brief details or attach relevant documents

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Subject: Survey Questionnaire
Project No: QM43502

Q13. Are there any other matters, or information you are able to provide in relation to performance monitoring of the transmission system operated by your company ?

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Appendix F TNSP Responses – Service Standards Used & Monitored (Australia & International)

Summary of Transmission System details

Australian Transmission Network Service Providers

Parameter	Voltage	ElectraNet		EnergyAustralia		Powerlink		SPI PowerNet		Snowy Hydro		Transend		TransGrid	
		Overhead	Underground	Overhead	Underground	Overhead	Underground	Overhead	Underground	Overhead	Underground	Overhead	Underground	Overhead	Underground
Circuit lengths of transmission lines	66 kV	14 km	2 km	50 km		1 km	1 km	141 km						62 km	
	69 kV														
	88 kV											73 km			
	110 kV					528 km	6 km					1,951 km	12 km		
	115 kV														
	132 kV	2,988 km		402 km	214 km	3,958 km				60 km				5,102 km	
	138 kV														
	161 kV														
	220 kV							3,941 km				1,463 km		681 km	
	230 kV														
	275 kV	2,563 km	8 km			6,084 km	5 km	157 km							
	330 kV					505 km		739 km		212 km				5,109 km	20 km
	345 kV														
	400 kV														
	500 kV							1,017 km						1,057 km	
System Maximum Demand		2,837 MW		4,983 MW		6,585 MW		Not Provided		3,756 MW		1,640 MW		11,360 MW	
Energy delivered through system		12,403 GWh		28,930 GWh		38,651 GWh		approx 28,000 GWh		5,200 GWh		9,653 GWh		68,066 GWh	
Regulated Network revenue		Not Provided		$75,570,000		$318,500,000		Not Provided		$10,750,000		$68,414,000		$343,000,000	

International Transmission Network Service Providers

Parameter	Voltage	New Zealand		United Kingdom				United States of America									
		Transpower		National Grid		Scottish & Southern Energy		California ISO		Idaho Power		Montana Power		San Diego Gas & Electric		Southern California Edison	
		Overhead	Underground	Overhead	Underground	Overhead	Underground	Overhead	Underground	Overhead	Underground	Overhead	Underground	Overhead	Underground	Overhead	Underground
Circuit lengths of transmission lines	50 kV	338 km															
	66 kV	1,291 km														7,646 km	393 km
	69 kV							11,583 km	83 km	1,954 km		1,535 km		1,332 km	86 km		
	88 kV																
	110 kV	6,153 km	5 km														
	115 kV							13,000 km	334 km	6 km		2,245 km				2,975 km	16 km
	132 kV			192 km	60 km	3,240 km	54 km										
	138 kV									2,225 km				421 km	10 km		
	161 kV									224 km		1,195 km					
	220 kV	8,381 km														5,286 km	
	230 kV							10,667 km	167 km	1,457 km		1,019 km		572 km			
	275 kV			3,377 km	429 km	1,550 km	4 km										
	330 kV																
	345 kV									925 km							
	400 kV			10,209 km	133 km												
	500 kV							4,167 km		3 km		530 km		447 km		1,773 km	
System Maximum Demand		6,169 MW		53,200 MW		1,671 MW		45,000 MW		2,927 MW		1,560 MW		4,000 MW		19,757 MW	
Energy delivered through system		36,750 GWh		303,100 GWh		11,806 GWh		Not Provided		17 GWh		1,036 GWh		Not Provided		81,021 GWh	
Regulated Network revenue		NZ $437,000,000		£900,000,000		£48,200,000		Not Provided		Not Provided		US $50,000,000		Not Provided		US $730,738,169	

Service Standards Used and Monitored

I	Internal or Company measure only
R	Regulatory requirement for measure
I / R	Used for both internal & regulatory reporting
X	Measure not currently reported but under development

No.	Service Standard Measure	Australia							NZ	UK		USA				
		ElectraNet SA	EnergyAustralia	Powerlink	PowerNet	Snowy Hydro	Transend	TransGrid	Transpower	National Grid	Scottish & Southern Energy	California ISO	Idaho Power	Montana Power	San Diego Gas & Electric	Southern California Edison
	System															
1	System Average Interruption Duration Index (SAIDI)		I / R							I / R					I / R	
2	System Average Interruption Frequency Index (SAIFI)		I / R							I / R					I / R	
3	Customer Average Interruption Duration Index (System) (CAIDI)		I / R													
4	Interruption - energy not supplied	I		I				I / R	I / R	I / R						
5	Transmission circuit availability	I	I / R	I / R	I / R	I / R	I / R	I / R	I / R	I / R	I / R				I	I / R
6	Annual total of sustained under / over voltage excursions									I / R						
7	Annual total of excessive transient voltage excursions									I / R						
	For Multiple Connection Points															
8	Annual total of unplanned outages			I / R						I / R	I				I	I
9	Annual total of unplanned outages causing loss of supply			I			I / R			I / R					I	
10	Energy not supplied during outage			I						I / R						
11	Maximum load lost during outage									I / R						
12	Outage duration			I			I / R			I / R					I	I
	For Individual Connection Points															
13	Customer Average Interruption Duration Index (CAIDI)															
14	Customer maximum interruption duration															
15	Customer minimum interruption duration															
16	Customer average interruption frequency								I						I / R	
17	Average restoration time								I	I / R						
18	Annual total of unplanned outages					I			I	I / R					I	I
19	Annual total of energy not supplied during unplanned outage								I	I / R						
20	Maximum load lost during unplanned outage									I / R						
21	Duration of planned interruptions								I	I / R						I
22	Frequency of planned interruptions								I	I / R						
23	Period of notice for planned interruptions															
	Market Related Measures															
24	Cost of transmission outages								R	I					I / R	I

Service Standards Used and Monitored

I	Internal or Company measure only
R	Regulatory requirement for measure
I / R	Used for both internal & regulatory reporting
X	Measure not currently reported but under development

No.	Service Standard Measure	Australia							NZ	UK		USA				
		ElectraNet SA	EnergyAustralia	Powerlink	PowerNet	Snowy Hydro	Transend	TransGrid	Transpower	National Grid	Scottish & Southern Energy	California ISO	Idaho Power	Montana Power	San Diego Gas & Electric	Southern California Edison
25	Potential / actual cost benefits from rescheduling planned outage / improved restoration performance									I						I
26	Comparison of potential savings and actual costs of outage from rescheduling planned outage / improved restoration performance									I						
27	Retrospective assessment of actual costs and benefits of augmentation									I						
28	Outcomes from availability incentive scheme (if such a scheme exists)									I / R						
29	Annual total of network constraint events								X	I	I / R					
30	Amount of additional generation to overcome network constraints									I	I / R					
31	Cost of additional energy to overcome network constraints									I	I / R					I
32	Interconnector and critical circuit availability		I			I / R			I / R	I / R						
	Other															
33	SAIIR System Minutes	I / R														
34	SAIIR No. of Supply Interruptions	I / R														
35	Interconnector Forced Outage Rate					I										
36	Line Forced Outage Rate for equipment failure & op error				I / R											
37	Line Forced Outage Rate for Lightning and Storms				I / R											
38	Mean Duration of Forced Outages (Circuits)				I / R											
39	Successful Auto Reclose of Circuits				I / R											
40	Forced Outage Rate (transformers)				I / R											
41	Mean Duration of Forced Outage (transformers)				I / R											
42	Availability of Transformers				I / R											
43	Availability of Static VAR Compensators				I / R											
44	Availability of Synchronous Condensors				I / R											
45	Availability of Capacitor Banks				I / R											
46	Availability of Protection Systems				I / R											
47	Incorrect Protection Operations				I / R											

Service Standards Used and Monitored

I	Internal or Company measure only
R	Regulatory requirement for measure
I / R	Used for both internal & regulatory reporting
X	Measure not currently reported but under development

No.	Service Standard Measure	Australia							NZ	UK		USA				
		ElectraNet SA	EnergyAustralia	Powerlink	PowerNet	Snowy Hydro	Transend	TransGrid	Transpower	National Grid	Scottish & Southern Energy	California ISO	Idaho Power	Montana Power	San Diego Gas & Electric	Southern California Edison
48	Contractural (Rebates) - Generation constrained				I / R											
49	Contractural (Rebates) - Shared Network Availability				I / R											
50	Total number of loss of supply events > 0.2 system minutes			I / R												
51	Total number of loss of supply events > 0.1 system minutes			I / R												
52	Percentage unplanned connection point interruptions not restored within 3 hours			I / R												
53	Total balancing costs (including constraints & losses)									I / R						
54	No. of frequency excursions larger than +/- 1% and exceeding 60 seconds									I / R						
55	Transmission Availability Composite (TAC) score													I / R		
56	MAIFI Momentary Forced Interruptions														I / R	
57 to 68	Annual Forced Outage Frequency (66, 115, 220, 500 kV)															I / R
	Annual Forced Outage Duration (66, 115, 220, 500 kV)															I / R
	Proportion of transmission line circuits with no forced outages (66, 115, 220, 500 kV)															I / R
69	French Interconnector availability									I / R						
70	Scottish Interconnector availability									I / R						

Appendix G TNSP Responses – Performance Data (Australia & International)

Summary of Transmission System data

No.	Service Standard Measure	Period	Australia							NZ	UK		USA				
			ElectraNet SA	Energy Australia	Powerlink	SPI PowerNet	Snowy Hydro	Transend	TransGrid	Transpower	National Grid	Scottish & Southern Energy	California ISO	Idaho Power	Montana Power	San Diego Gas & Electric	Southern California Edison
	System																
1	System Average Interruption Duration Index (SAIDI)	1996/97		66.66													
	Units ~ Minutes per year	1997/98		97.20													
		1998/99		93.95													
		1999/00		84.00													
		2000/01		96.39													
2	System Average Interruption Frequency Index (SAIFI)	1996/97		0.98													
	Units ~ Number per year	1997/98		1.22													
		1998/99		1.29													
		1999/00		1.26													
		2000/01		1.21													
3	Customer Average Interruption Duration Index (System) (CAIDI)	1996/97		67.79													
	Units ~ Minutes per year	1997/98		79.80													
		1998/99		73.00													
		1999/00		66.63													
		2000/01		79.67													
4	Interruption - energy not supplied	1996/97			1.80 *				1.59 *	11.50 *	83.00 *						
	Units ~ System Minutes	1997/98	875.79 *		2.50 *				1.21 *	2.90 *	441.00 *						
		1998/99	413.54 *		3.20 *				0.96 *	7.10 *	36.00 *						
		1999/00	100.43 *		11.10 *				4.23 *	2.10 *	292.50 *						
		2000/01	529.79 *						0.67 *	11.60 *	526.00 *						
5	Transmission circuit availability	1996/97				99.57			99.57	98.90 *	95.80	97.36					99.99
	Units ~ %	1997/98	99.23			99.54			99.54	99.10 *	96.30	97.53					99.99
		1998/99	99.25			99.58	99.67	99.13	99.37	99.10 *	96.30	97.31					99.99
		1999/00	99.67		99.60	99.69	98.63	99.17	99.42	99.20 *	96.00	97.02					99.99
		2000/01	99.63	96.55		99.71	99.55	98.96	99.62	98.90 *	95.80	98.13					99.99
6	Annual total of sustained under / over voltage excursions	1996/97									0.00						
	Units ~ Number per year	1997/98									2.00						
		1998/99									0.00						
		1999/00									0.00						
		2000/01									1.00						
7	Annual total of excessive transient voltage excursions	1996/97															
	Units ~ Number per year	1997/98															
		1998/99															
		1999/00															
		2000/01															

Summary of Transmission System data

No.	Service Standard Measure	Period	Australia							NZ	UK		USA				
			ElectraNet SA	EnergyAustralia	Powerlink	SPI PowerNet	Snowy Hydro	Transend	TransGrid	Transpower	National Grid	Scottish & Southern Energy	California ISO	Idaho Power	Montana Power	San Diego Gas & Electric	Southern California Edison
	For Multiple Connection Points																
8	Annual total of unplanned outages	1996/97			201.00							122.00					469.00
	Units ~ Number per year	1997/98			219.00							147.00					382.00
		1998/99			165.00							167.00					366.00
		1999/00			173.00							138.00					423.00
		2000/01										74.00					355.00
9	Annual total of unplanned outages causing loss of supply	1996/97			19.00						14.00 *						
	Units ~ Number per year	1997/98			24.00						14.00 *						
		1998/99			20.00			45.00			5.00 *						
		1999/00			20.00			47.00			4.00 *						
		2000/01						59.00			3.00 *						
10	Energy not supplied during outage	1996/97															
	Units ~ MWh	1997/98															
		1998/99															
		1999/00															
		2000/01															
11	Maximum load lost during outage	1996/97															
	Units ~ MW	1997/98															
		1998/99															
		1999/00															
		2000/01															
12	Outage duration	1996/97									7.00						57509
	Units ~ Minutes per year	1997/98									18.00						30548
		1998/99						3954.00			11.00						30277
		1999/00									48.00						20001
		2000/01						4174.00			68.00						13606
	For Individual Connection Points																
13	Customer Average Interruption Duration Index (CAIDI)	1996/97															
	Units ~ Minutes per year	1997/98															
		1998/99															
		1999/00															
		2000/01															
14	Customer maximum interruption duration	1996/97															
	Units ~ Minutes	1997/98															
		1998/99															
		1999/00															
		2000/01															

Summary of Transmission System data

No.	Service Standard Measure	Period	Australia							NZ	UK		USA				
			ElectraNet SA	Energy Australia	Powerlink	SPI PowerNet	Snowy Hydro	Transend	TransGrid	Transpower	National Grid	Scottish & Southern Energy	California ISO	Idaho Power	Montana Power	San Diego Gas & Electric	Southern California Edison
15	Customer minimum interruption duration	1996/97															
	Units ~ Minutes	1997/98															
		1998/99															
		1999/00															
		2000/01															
16	Customer average interruption frequency	1996/97															
	Units ~ Number per year	1997/98								Report to customer, annual QPR *							
		1998/99															
		1999/00															
		2000/01															
17	Average restoration time	1996/97															
	Units ~ Minutes	1997/98															
		1998/99															
		1999/00															
		2000/01															
18	Annual total of unplanned outages	1996/97								92.00							48.00
	Units ~ Minutes	1997/98								58.00							28.00
		1998/99					0.00			69.00							17.00
		1999/00					0.00			50.00							21.00
		2000/01					0.00			55.00							9.00
19	Annual total of energy not supplied during unplanned outage	1996/97															
	Units ~ MWh	1997/98															
		1998/99															
		1999/00															
		2000/01															
20	Maximum load lost during unplanned outage	1996/97															
	Units ~ MW	1997/98															
		1998/99															
		1999/00															
		2000/01															
21	Duration of planned interruptions	1996/97															5636
	Units ~ Minutes per year	1997/98								Individual POS result report to customer							2263
		1998/99															956
		1999/00															17581
		2000/01															169

Summary of Transmission System data

No.	Service Standard Measure	Period	Australia							NZ	UK		USA				
			ElectraNet SA	Energy Australia	Powerlink	SPI PowerNet	Snowy Hydro	Transend	TransGrid	Transpower	National Grid	Scottish & Southern Energy	California ISO	Idaho Power	Montana Power	San Diego Gas & Electric	Southern California Edison
22	Frequency of planned interruptions	1996/97								Individual POS result report to customer							
	Units ~ Number per year	1997/98															
		1998/99															
		1999/00															
		2000/01															
23	Period of notice for planned interruptions	1996/97															
	Units ~ Days	1997/98															
		1998/99															
		1999/00															
		2000/01															
	Market Related Measures																
24	Cost of transmission outages	1996/97								Req'd by Regulator, unable to calculate							
	Units ~ $ (Aus, NZ, USA) / £ (UK) per year	1997/98															
		1998/99															
		1999/00															
		2000/01															
25	Potential / actual cost benefits from rescheduling planned outage / improved restoration performance	1996/97															
	Units ~ $ (Aus, NZ, USA) / £ (UK)	1997/98															
		1998/99															
		1999/00															
		2000/01															
26	Comparison of potential savings and actual costs of outage from rescheduling planned outage / improved restoration performance	1996/97															
	Units ~ $ (Aus, NZ, USA) / £ (UK)	1997/98															
		1998/99															
		1999/00															
		2000/01															
27	Retrospective assessment of actual costs and benefits of augmentation	1996/97															
	Units ~ $ (Aus, NZ, USA) / £ (UK)	1997/98															
		1998/99															
		1999/00															
		2000/01															
28	Outcomes from availability incentive scheme (if such a scheme exists)	1996/97															
	Units ~ $ (Aus, NZ, USA) / £ (UK)	1997/98															
		1998/99															
		1999/00															

Summary of Transmission System data

No.	Service Standard Measure	Period	Australia							NZ	UK		USA				
			ElectraNet SA	Energy Australia	Powerlink	SPI PowerNet	Snowy Hydro	Transend	TransGrid	Transpower	National Grid	Scottish & Southern Energy	California ISO	Idaho Power	Montana Power	San Diego Gas & Electric	Southern California Edison
		2000/01															

Summary of Transmission System data

No.	Service Standard Measure	Period	Australia							NZ	UK		USA				
			ElectraNet SA	Energy Australia	Powerlink	SPI PowerNet	Snowy Hydro	Transend	TransGrid	Transpower	National Grid	Scottish & Southern Energy	California ISO	Idaho Power	Montana Power	San Diego Gas & Electric	Southern California Edison
29	Annual total of network constraint events	1996/97								Measure being developed							
	Units ~ Number per year	1997/98															
		1998/99															
		1999/00															
		2000/01										99.00					
30	Amount of additional generation to overcome network constraints	1996/97															
	Units ~ MW	1997/98															
		1998/99															
		1999/00															
		2000/01										320.00					
31	Cost of additional energy to overcome network constraints	1996/97										92.05					
	Units ~ $ (Aus, NZ, USA) / £ (UK)	1997/98										97.90					
		1998/99										97.13					
		1999/00										95.48					
		2000/01										93.27					
32	Interconnector and critical circuit availability	1996/97								97.30 *	Refer measures 69 and 70						
	Units ~ %	1997/98								97.40 *							
		1998/99					99.36			96.50 *							
		1999/00					98.81			97.30 *							
		2000/01		95.98			99.99			96.90 *							
	Other																
33	SAIIR System Minutes	1996/97															
	Units ~ System Minutes	1997/98	2.49														
		1998/99	8.18														
		1999/00	2.09														
		2000/01	5.04														
34	SAIIR No. of Supply Interruptions	1996/97															
	Units ~ Number per year	1997/98	24.00														
		1998/99	15.00														
		1999/00	23.00														
		2000/01	26.00														
35	Interconnector Forced Outage Rate	1996/97															
	Units ~ %	1997/98															
		1998/99					0.07										
		1999/00					0.00										
		2000/01					0.00										

Summary of Transmission System data

No.	Service Standard Measure	Period	Australia							NZ	UK		USA				
			ElectraNet SA	Energy Australia	Powerlink	SPI PowerNet	Snowy Hydro	Transend	TransGrid	Transpower	National Grid	Scottish & Southern Energy	California ISO	Idaho Power	Montana Power	San Diego Gas & Electric	Southern California Edison
36	Line Forced Outage Rate for equipment failure & op error	1996/97				0.14											
	Units ~ Inc per 100 km	1997/98				0.37											
		1998/99				0.31											
		1999/00				0.28											
		2000/01															
37	Line Forced Outage Rate for Lightning and Storms	1996/97				0.09											
	Units ~ Inc per 100 km	1997/98				0.09											
		1998/99				0.05											
		1999/00				0.06											
		2000/01															
38	Mean Duration of Forced Outages (Circuits)	1996/97				24.14											
	Units ~ Hours	1997/98				14.46											
		1998/99				7.52											
		1999/00				6.41											
		2000/01															
39	Successful Auto Reclose of Circuits	1996/97				82.00											
	Units ~ %	1997/98				78.00											
		1998/99				82.00											
		1999/00				80.00											
		2000/01															
40	Forced Outage Rate (transformers)	1996/97				0.12											
	Units ~ Inc per year	1997/98				0.01											
		1998/99				0.06											
		1999/00				0.25											
		2000/01															
41	Mean Duration of Forced Outage (transformers)	1996/97				8.52											
	Units ~ Hours	1997/98				3.13											
		1998/99				5.92											
		1999/00				92.71											
		2000/01															
42	Availability of Transformers	1996/97				99.70											
	Units ~ %	1997/98				99.79											
		1998/99				99.62											
		1999/00				99.35											
		2000/01															

Summary of Transmission System data

No.	Service Standard Measure	Period	Australia							NZ	UK		USA				
			ElectraNet SA	Energy Australia	Powerlink	SP PowerNet	Snowy Hydro	Transend	TransGrid	Transpower	National Grid	Scottish & Southern Energy	California ISO	Idaho Power	Montana Power	San Diego Gas & Electric	Southern California Edison
43	Availability of Static VAR Compensators	1996/97				98.88											
	Units ~ %	1997/98				99.42											
		1998/99				99.04											
		1999/00				99.28											
		2000/01															
44	Availability of Synchronous Condensors	1996/97				92.43											
	Units ~ %	1997/98				90.10											
		1998/99				72.95											
		1999/00				90.78											
		2000/01															
45	Availability of Capacitor Banks	1996/97				99.56											
	Units ~ %	1997/98				99.60											
		1998/99				98.94											
		1999/00				99.15											
		2000/01															
46	Availability of Protection Systems	1996/97															
	Units ~ %	1997/98															
		1998/99															
		1999/00															
		2000/01															
47	Incorrect Protection Operations	1996/97				3.33											
	Units ~ %	1997/98				3.53											
		1998/99				6.49											
		1999/00				1.19											
		2000/01															
48	Contractural (Rebates) - Generation constrained	1996/97															
	Units ~ $ (Aus, NZ, USA) / £ (UK)	1997/98															
		1998/99															
		1999/00															
		2000/01															
49	Contractural (Rebates) - Shared Network Availability	1996/97															
	Units ~ $ (Aus, NZ, USA) / £ (UK)	1997/98															
		1998/99															
		1999/00															
		2000/01															

Summary of Transmission System data

No.	Service Standard Measure	Period	Australia							NZ	UK		USA				
			ElectraNet SA	Energy Australia	Powerlink	SPI PowerNet	Snowy Hydro	Transend	TransGrid	Transpower	National Grid	Scottish & Southern Energy	California ISO	Idaho Power	Montana Power	San Diego Gas & Electric	Southern California Edison
50	Total number of loss of supply events > 0.2 system minutes	1996/97			0.00												
	Units ~ Number per year	1997/98			3.00												
		1998/99			1.00												
		1999/00			2.00												
		2000/01															
51	Total number of loss of supply events > 0.1 system minutes	1996/97			5.00												
	Units ~ Number per year	1997/98			4.00												
		1998/99			2.00												
		1999/00			5.00												
		2000/01															
52	Percentage unplanned connection point interruptions not restored within 3 hours	1996/97															
	Units ~ %	1997/98															
		1998/99															
		1999/00															
		2000/01															
53	Total balancing costs (including constraints & losses)	1996/97															
	Units ~ $ (Aus, NZ, USA) / £ (UK)	1997/98															
		1998/99															
		1999/00															
		2000/01															
54	No. of frequency excursions larger than +/- 1% and exceeding 60 seconds	1996/97															
	Units ~ Number	1997/98															
		1998/99															
		1999/00															
		2000/01															
55	Transmission Availability Composite (TAC) score	1996/97													169.00		
	Units ~ Number	1997/98													182.00		
		1998/99													184.00		
		1999/00													169.00		
		2000/01													188.00		
56	MAIFI Monetary Forced Interruptions	1996/97															
	Units ~ Number (assumed as not stated)	1997/98															
		1998/99															
		1999/00															
		2000/01															

Summary of Transmission System data

No.	Service Standard Measure	Period	Australia							NZ	UK		USA				
			ElectraNet SA	Energy Australia	Powerlink	SPI PowerNet	Snowy Hydro	Transend	TransGrid	Transpower	National Grid	Scottish & Southern Energy	California ISO	Idaho Power	Montana Power	San Diego Gas & Electric	Southern California Edison
57	500 kV Annual Forced Outage Frequency	1996/97															2.05
	Units ~ Number per year	1997/98															0.63
		1998/99															1.00
		1999/00															2.00
		2000/01															0.84
		14 yr Mean															1.39
58	500 kV Annual Forced Outage Duration	1996/97															712.00
	Units ~ Minutes	1997/98															738.00
		1998/99															362.00
		1999/00															142.00
		2000/01															141.00
		14 yr Mean															559.00
59	500 kV Proportion of Lines without Forced Outages	1996/97															36.80
	Units ~ %	1997/98															57.90
		1998/99															52.60
		1999/00															31.60
		2000/01															42.10
		14 yr Mean															41.80
60	220 kV Annual Forced Outage Frequency	1996/97															0.70
	Units ~ Number per year	1997/98															0.70
		1998/99															0.48
		1999/00															0.50
		2000/01															0.48
		14 yr Mean															0.63
61	220 kV Annual Forced Outage Duration	1996/97															738.00
	Units ~ Minutes	1997/98															222.00
		1998/99															119.00
		1999/00															37.50
		2000/01															62.50
		14 yr Mean															265.00
62	220 kV Proportion of Lines without Forced Outages	1996/97															74.60
	Units ~ %	1997/98															74.60
		1998/99															81.70
		1999/00															74.60
		2000/01															75.40
		14 yr Mean															71.20

Summary of Transmission System data

No.	Service Standard Measure	Period	Australia							NZ	UK		USA				
			ElectraNet SA	Energy Australia	Powerlink	SPI PowerNet	Snowy Hydro	Transend	TransGrid	Transpower	National Grid	Scottish & Southern Energy	California ISO	Idaho Power	Montana Power	San Diego Gas & Electric	Southern California Edison
63	115 kV Annual Forced Outage Frequency	1996/97															2.75
	Units ~ Number per year	1997/98															3.08
		1998/99															2.71
		1999/00															2.67
		2000/01															2.92
		14 yr Mean															3.48
64	115 kV Annual Forced Outage Duration	1996/97															390.00
	Units ~ Minutes	1997/98															151.40
		1998/99															377.00
		1999/00															151.00
		2000/01															177.00
		14 yr Mean															225.00
65	115 kV Proportion of Lines without Forced Outages	1996/97															41.70
	Units ~ %	1997/98															37.50
		1998/99															29.20
		1999/00															54.20
		2000/01															29.20
		14 yr Mean															33.00
66	66 kV Annual Forced Outage Frequency	1996/97															2.33
	Units ~ Number per year	1997/98															2.80
		1998/99															3.30
		1999/00															3.61
		2000/01															2.30
		14 yr Mean															3.48
67	66 kV Annual Forced Outage Duration	1996/97															455.00
	Units ~ Minutes	1997/98															332.00
		1998/99															352.00
		1999/00															287.00
		2000/01															149.00
		14 yr Mean															331.00
68	66 kV Proportion of Lines without Forced Outages	1996/97															33.30
	Units ~ %	1997/98															36.70
		1998/99															36.70
		1999/00															20.00
		2000/01															30.00
		14 yr Mean															29.00

Summary of Transmission System data

No.	Service Standard Measure	Period	Australia							NZ	UK		USA				
			ElectraNet SA	Energy Australia	Powerlink	SPI PowerNet	Snowy Hydro	Transend	TransGrid	Transpower	National Grid	Scottish & Southern Energy	California ISO	Idaho Power	Montana Power	San Diego Gas & Electric	Southern California Edison
69	French Interconnector availability	1996/97									97.30						
	Units ~ %	1997/98									97.90						
		1998/99									97.40						
		1999/00									95.60						
		2000/01									96.20						
70	Scottish Interconnector availability	1996/97									97.30						
	Units ~ %	1997/98									95.40						
		1998/99									98.30						
		1999/00									99.90						
		2000/01									99.70						

Notes :

ElectraNet
* *Interruption - energy not supplied* measured as lost minutes

Powerlink
* *Interruption - energy not supplied* measured as system minutes based on highest maximum demand prior to the event

TransGrid
* *Interruption - energy not supplied* measured as system minutes of TransGrid caused supply interruptions on TransGrid owned equipment

Transpower
* *Interruption - energy not supplied* measured as system minutes = MW minutes / system demand peak
* *Transmission circuit availability* measured for HVAC system only
* *Interconnector and critical ciruit availability* measured for HVDC line
* QPR - Annual Quality Power Report available on website www.transpower.co.nz

National Grid
* Values include anomalous losses which result from particular connection or running arrangments chosen by customers or from other causes which are not due to faults on National Grid equipment.
  These losses were 25 MWh (1996/97), 221 MWh (1997/98), 5 MWh (1998/99), 0.5 MWh (1999/00), and 425 MWh (2000/01).
  The number of such incidents were 5 (1996/97), 5 (1997/98), 3 (1998/99), 1 (1999/00), and 2 (2000/01).

Appendix H Glossary of Terms

Definitions for various terms as used in this discussion paper are set out below:

ACCC

Australian Competition and Consumer Commission as established by the *Trade Practices Act 1974*.

Ancillary services

Services provided by electricity entities or customers through the operations of their works or installations in ways that are not directly related to the generation and supply of electricity, but are to ensure the stable and secure operation of an electricity system and its recovery from emergency situations, including services that are essential to the management of power system security, facilitate orderly trading in electricity and ensure that electricity supplies are of acceptable quality.

CAPEX

Capital Expenditure.

Customer Average Interruption Duration Index (CAIDI)

Average duration of each supply interruption per customer who experienced a supply interruption within the distribution network (or defined part of the distribution network).

Distribution

Operation of equipment used to convey electricity through a distribution network.

Feeder

A part of the distribution network through which supply to a defined group of customers is directed.

Generation

Operation of any kind of electricity generating plant.

GST

Good and Services Tax introduced by the Federal Government on 1 July 2000.

NECA

National Electricity Code Authority.

NEM

National Electricity Market, arrangements for which are set out in the National Electricity Law.

NEMMCO

National Electricity Market Management Company.

Network services

Services for electricity transfer provided by transmission entities connected to a transmission grid or supply network.

OPEX

Operating Expenditure.

Retailing

Sale of electricity to customers.

SAIIR

South Australian Independent Industry Regulator established by S.4 of the *Independent Industry Regulator Act 1999*.

System Average Interruption Duration Index (SAIDI)

Length of time each customer is without supply when averaged over all customers in the distribution network (or defined part of the distribution net work).

System Average Interruption Frequency Index (SAIFI)

Number of supply interruptions each customer experiences for the year when averaged over all customers on the distribution network (or defined part of the distribution network).

System Minutes Off Supply

Amount of unsupplied energy across the transmission system divided by peak demand, and is a measure of the service level of the transmission network.

TNSP

Transmission Network Service Provider

Transmission

Operation of equipment used to convey electricity through a transmission network.