Audit of TransGrid Service Standards Performance Reporting 2005

PERFORMANCE RESULTS FOR 2005

- Final Report
- 24 March 2006

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1. Introduction

Sinclair Knight Merz (SKM) has been appointed by the Australian Energy Regulator (AER) (formally the ACCC) to conduct an audit of the January to December 2005 performance report of TransGrid under the AER / ACCC Performance Incentives (PI) Scheme.

This review has included an examination of the accuracy and adequacy of the recording system for TransGrid, together with an assessment of the application of force majeure and other exclusions.

Other issues that have been investigated and reported on include:

- whether the reporting complies with the requirements of TransGrid's revenue cap decision and the AER Service Standards Guidelines;
- adequacy of recording systems and a review of any changes since previous audits;
- comparison of the actual results achieved relative to the targets set in the revenue cap decisions; and
- an independent validation, or otherwise, of the calculations and the S-factors.

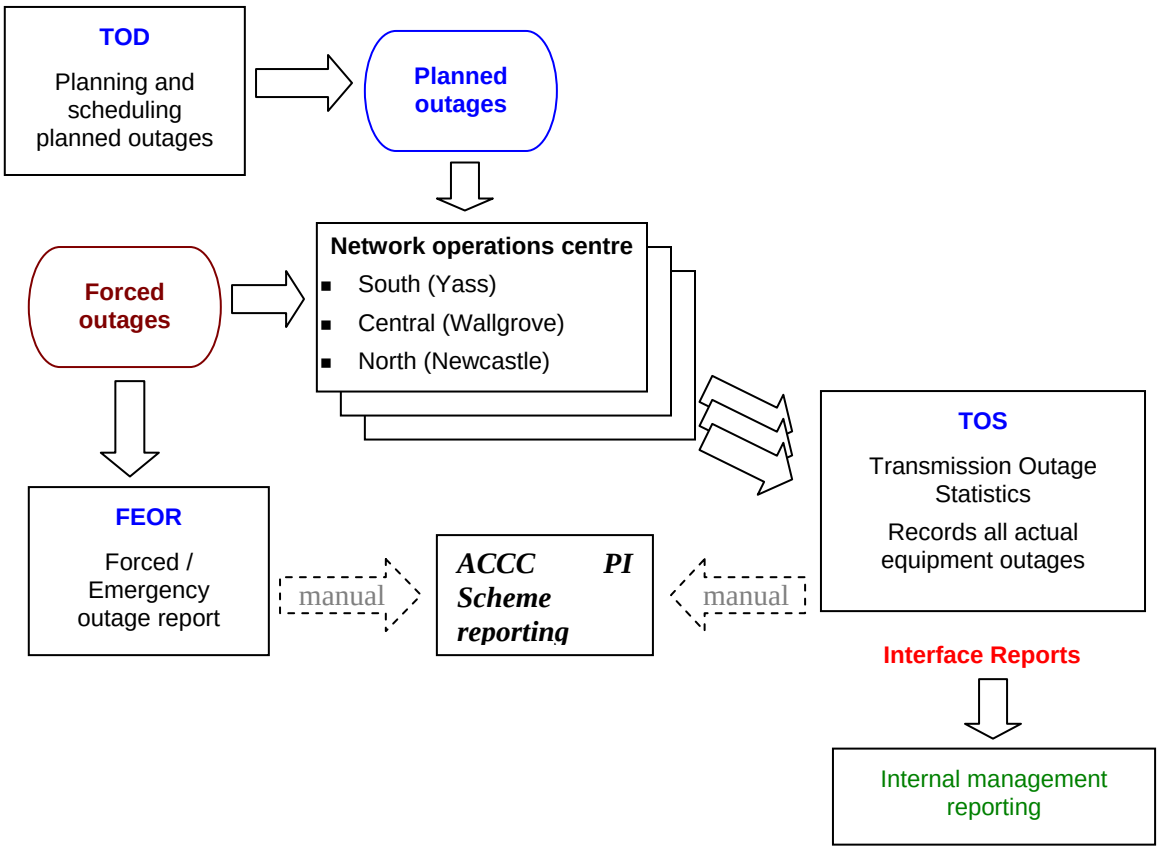
2. Recording System

SKM recommended in a previous audit of TransGrid's reporting that the existing manual reporting system be developed and refined by TransGrid to reduce the risk of manual errors. TransGrid are in the process of developing a new recording system "THEOS". As THEOS will incorporate a number of significant operational systems, TransGrid estimate it will not be operational for three years, and the existing system for the calculation of S-factor will continue to be used for this time.

2.1 Existing recording process

An overview of the existing TransGrid PI reporting systems is shown in Figure 1.

- **Figure 1 TransGrid PI reporting systems**



2.2 PI Reporting System

TransGrid's PI Reporting System is based around its Transmission Outage Statistics (TOS) database that records all planned and unplanned outages. Operators in the three TransGrid control rooms enter outage details at the end of each shift into a central database. TOS started as a VAX based system in 1992, and was migrated onto a PC platform in 2000.

Planned outages are scheduled in a Transmission Outage Diary (TOD) system, but there is no link between the two systems. That is, operators enter the details into TOS as it actually occurs.

Forced outages are also entered by operators into TOS. Forced outages also trigger a Forced and Emergency Outage Report that explains the reason for each outage.

PI Reporting System is done in a separate system to TOS. Details of outages are manually transferred from TOS reports each month into a "Monthly Outage Summary" spreadsheet by staff in the Network Performance section. Filtering of excluded events take place at this time, with excluded events omitted from the monthly outage summary spreadsheets, from which performance statistics and S Factors are derived. Forced / Emergency Outage Report (FEOR) reports are consulted to determine whether events are to be excluded, as are details on TOS, system diagrams, and knowledge of ownership of various pieces of equipment.

Some manual intervention is required to derive the PI reporting from TOS, as TOS only records outages on the equipment that has actually been switched. Therefore, if an outage on a circuit breaker is recorded in TOS, it is necessary to review system diagrams to determine whether a transmission circuit or transformer will also be taken out of service as a consequence. Network Performance staff assess each outage recorded in TOS to determine which relevant items are affected in the PI Reporting System.

PI reporting is derived from a series of spreadsheets linked to the 12 monthly outage summary spreadsheets. These are mostly automatic following the manual input of the TOS data, with manual adjustments for capping outages at 168 hours and numbers of plant items.

2.3 Outage Details

Planned outages are scheduled in the TOD system, and when switching actually takes place are entered into TOS. Forced and emergency[1] outages are recorded in TOS as they occur. The actual switching times are recorded directly in TOS, with reference to the daily operators log.

2.4 Categorisation and Exclusions

Outages entered into TOS are categorised as "TransGrid reason" or "non-TransGrid reason" by the operators. Network performance staff check these categorisations when they manually enter the data into the PI reporting spreadsheets, and make adjustments as required. This sometimes requires reference to FEOR reports to identify the cause and responsible party.

[1] TransGrid defines a forced outage as an automatic protection operation, and emergency outages as forced switching under control of operators.

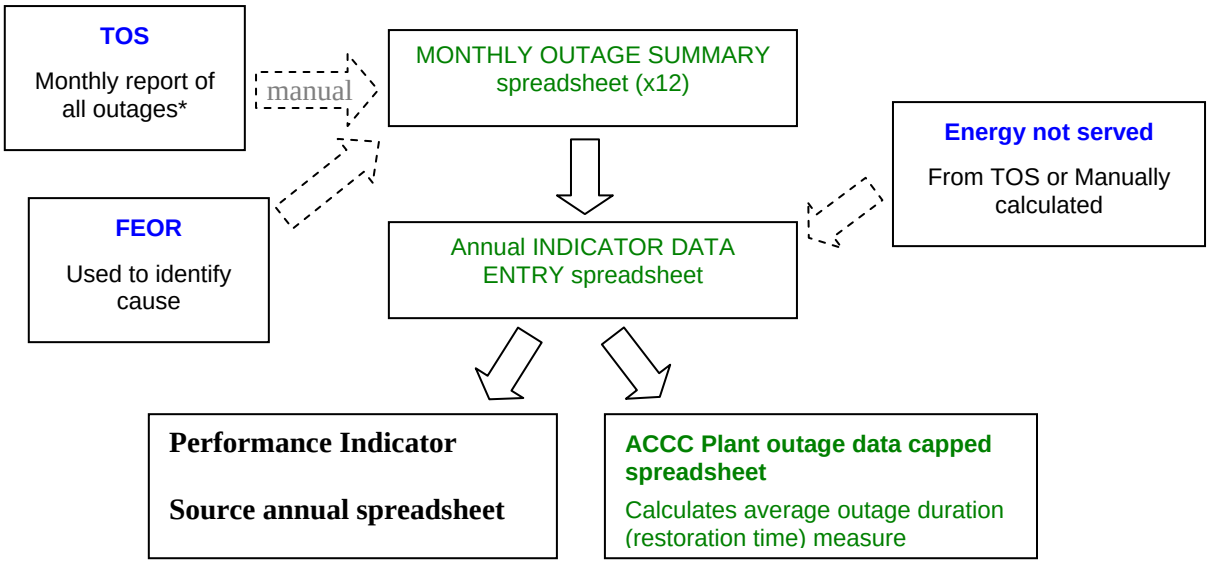
Outages on equipment not owned by TransGrid are excluded. These are generally distribution network lines where TransGrid owns the circuit breaker[2] and a Distribution Network Service Provider (DNSP) owns the line. There are also instances when EnergyAustralia transmission lines are taken out of service due to TransGrid maintenance or outages on circuit breakers. TransGrid exclude such events as they do not own the line and EnergyAustralia exclude them as a third party (TransGrid) caused it. This effectively means a number of transmission line outages are not captured by the scheme.[3]

Auditing exclusions are made more difficult due to the structure of the PI Reporting system, whereby excluded events are not transferred to the monthly outage summary spreadsheets. In order to identify excluded events, it is necessary to go back to raw TOS reports for a given month, and compare each event line by line to see which ones were included in TOS but not in the PI Reporting spreadsheets, and then check whether the event was properly categorised as excluded.

2.5 Processing of Outage Data

The PI Reporting system used by TransGrid is shown in Figure 2.

Figure 2 TransGrid PI reporting systems



[2] Circuit breaker outages are not covered by the PI Reporting System, even when they are owned by TransGrid.

[3] This situation appears to be relatively unique to TransGrid and EnergyAustralia, where TNSP boundaries occur within substations. With other TNSPs interconnectors will generally be partially owned by the TNSP at either end, and hence both will have a line outage captured by the scheme, so whoever caused the outage will have an event to report.

TransGrid also noted that the previous month's OUTAGE SUMMARY spreadsheet is checked as part of the monthly transfer process, to ensure that any late entries into TOS are captured.

2.6 Audit walk-through of the existing system

Sinclair Knight Merz have carried out spot checks and a walk-though of the PI reporting process and although the system relies heavy on the manual inputting of data and manual checking of data, the process and the information within the system appears to be reliable.

However, it should be noted that as the new reporting system is not due to be fully operational for three years some simple modifications to the existing system could improve its performance:

- Automatically link the spreadsheets involved in the process to reduce the potential for human error; and
- Include all outages throughout the PI Reporting system and indicate which have been "included" or "excluded".

3. Performance Measures

As set out in table 9.8.1 of the NSW and ACT Transmission Network Revenue Cap TransGrid 2004/05 to 2008/09, TransGrid have reported on the follow measures:

- Transmission Circuit availability;
- Transformer availability;
- Reactive plant availability;
- Reliability (Events > 0.05 system minutes); and
- Reliability (Events > 0.04 system minutes).

3.1 Inclusions

Sinclair Knight Merz has considered the inclusions discussed in TransGrid's submitted narrative and can confirm that the inclusions are in line with those stated in the Service Standards guidelines.

3.2 Exclusions

The Service Standards guidelines contain provisions for certain defined events to be excluded from the calculated outage figures, on the basis that they are beyond the control of Transmission Network Service Providers (TNSPs) or consistent with historical reporting of outages. In addition to this list of exclusions TransGrid have included a number of specific exclusions not explicitly identified in the Service Standards guidelines these are as follows:

- Transient interruptions less than one (1) minute;
- Pumping station supply interruptions; and
- Where a customer's own control/protection system trips their plant during a transient voltage fluctuation or other quality of supply events, whether caused by TransGrid or otherwise.

As targets are based on historic data that included the same exclusions, Sinclair Knight Merz considers this acceptable until such time that a common set of criteria have been adopted.

4. TransGrid Specific Exclusions and Caps

Using the Service Standard guidelines and last year reporting outcome, TransGrid has highlighted the following events as exclusions or Caps, they therefore have been excluded from the calculations for the Performance Incentive Scheme. Details of these exclusions are set out in the following section.

4.1 Transmission Line Availability Measure

4.1.1 Emergency and Planned Outages on No.41 330kV Cable

This cable runs between Sydney South and Beaconsfield West, and the outage proposed exclusion extended from June to October 2005, totalling 1,285.3 hours.

TransGrid's narrative submission states that "... *During sewer connections by a third party for a residential development adjoining the cable route, open trench excavations passed beneath the cable. During this work, a water main burst washing away the soil beneath the cable, causing significant sag in the cable. Subsequent sewer pipe works caused further subsidence. TransGrid then prudently took the cable out of service as an emergency outage until the extent of the damage and the disposition of the problem could be satisfactorily addressed. As part of the remedial work, TransGrid took a further planned outage to inject grout to stabilise the ground beneath the cable. TransGrid consider these outages to be exclusion described as "Any outages caused by a third party" and/or also "a force majeure event*"."

Although Sinclair Knight Merz sympathises with TransGrid's situation, it does not consider this event to be an excluded event. Having considered the information supplied by TransGrid, SKM considers:

- This is not a 3rd party event as defined in the AER Service Standards Guidelines, which refer to examples of "electrical" 3rd party systems such as inter-trip signals and generator outages. These outage situations would typically be caused by DNSPs and NEMMCO, and consequently may result in prompted direction or direct de-energising of TransGrid circuits for the proper operation of the system. The Guidelines do not include burst water mains or a mistaken cable excavation by non-system 3rd parties such as contractors or cars hitting poles. Accordingly SKM does not consider excluded 3rd party events to include any event caused by any 3rd party that causes an outage on the network. SKM also notes that the Guidelines are somewhat ambiguous on this definition and would benefit from review.
- This is not a "force majeure" event, in that it was not unforeseeable, nor its impact extraordinary. While the mechanism of the cable failure was unusual, it does not differ materially from a party digging up a cable, and the information provided by TransGrid indicated it was aware of the works and had reservations regarding the quality of the work

being conducted. Under the service incentive scheme guidelines[4], the "beyond control" test is a necessary but not sufficient condition for an event to be considered as a "Excluded Force Majeure Event". In determining whether a FM event is excluded, AER will consider "was the event unforeseeable and its impact extraordinary, uncontrollable and not manageable?". SKM does not consider these additional criteria for an excluded FM event have been met in this instance, and recommends this event not be excluded.

Sinclair Knight Merz recommends this event should be capped at 14 days [5] (336 hours) for the purposes of calculating the circuit availability measure, in line with similar practice adopted with other TNSPs.

4.1.2 Emergency Outage 0-2005-E0008 on 30th September 2005

This outage occurred on the 330kV line no.21 Munmorah to Sydney North with tee to Tuggerah.

TransGrid's narrative submission states that *"... A member of the public overcame anti-climbing barriers to climb a 330kV steel tower and was at risk of injury by electric shock. The NSW Police Force directed TransGrid to de-energise the line until the man was returned to safety. While the outage duration was 3.78 hours, this impacted on three separately counted segments of 21 line, giving a total of 11.34 hours. TransGrid consider this outage to be excluded under the "force majeure event"."*

An internal TransGrid investigation in to the condition of the anti-climbing barriers determined they were suitable and in working order. Sinclair Knight Merz considers that TransGrid had in place every reasonably practical measure to prevent this situation from arising.

SKM recommends this event be excluded from the Performance Incentive Scheme calculations.

[4] Schedule 2, Statement of Principles for the Regulation of Transmission Revenue – Service Standards Guidelines.

[5] Capping the effect of events to 14 days was not included in the original PI Scheme, but its application in this instance would be consistent with performance calculations for other TNSPs.

4.2 Reliability (Loss of Supply Event Frequency) Measure

4.2.1 Outage 2-2005-F0164 on 25th July 2005

TransGrid's narrative submission states that "*... A local municipal council's road works contractor's excavating sub-contractor dug up and damaged TransGrid's Depot 11kV cable which crossed a public road from its 132kV substation. Every precaution had been taken to inform the contractor of the precise location of the cable concerned. This caused the trip of an 11kV busbar with a loss of distributor load > 0.05 and < 0.4 system minutes. This is excluded as described in 2.4.2: "Any outages caused by a 3rd party… "and / or also force majeure event : "acts and circumstances which is beyond the reasonable control of the party affected"*."

Sinclair Knight Merz does not consider this event to be an excluded event. Having considered the information supplied by TransGrid, SKM considers:

- This is not a 3rd party event as defined in the AER Service Standards Guidelines, which refer to examples of "electrical" 3rd party systems such as inter-trip signals and generator outages. These outage situations would be caused by DNSPs and NEMMCO and consequently may result in prompted direction or direct de-energising of TransGrid circuits for the proper operation of the system. The Guidelines do not include burst water mains or a mistaken cable excavation by non-system 3rd parties such as contractors or cars hitting poles. Accordingly SKM does not consider excluded 3rd party events to include any event caused by any 3rd party that causes an outage on the network. SKM also notes that the Guidelines are somewhat ambiguous on this definition and would benefit from review.
- This is not a "force majeure" event, in that it was not unforeseeable, nor its impact extraordinary. Cable faults due to mechanical damage are a common occurrence and in SKM's view a foreseeable event. Under the service incentive scheme guidelines[6], the "beyond control" test is a necessary but not sufficient condition for an event to be considered as a "Excluded Force Majeure Event". In determining whether a FM event is excluded, AER will consider "was the event unforeseeable and its impact extraordinary, uncontrollable and not manageable?" SKM does not consider these additional criteria for an excluded FM event has been met in this instance, and recommends this event not be excluded.

[6] Schedule 2, Statement of Principles for the Regulation of Transmission Revenue – Service Standards Guidelines.

4.3 Average Outage Restoration Time Measure

4.3.1 Emergency Outage on No.41 330kV cable

This cable runs between Sydney South and Beaconsfield West, and the outage proposed exclusion extended from June to July 2005, totalling 1,032 hours.

TransGrids narrative submission states that " ... *(See item 4.1.1 above). As this aligns with the proposed exclusion of the emergency outage, the 7 day capped component of the initial emergency outage for this measure should be excluded.*"

As Sinclair Knight Merz considers the outage discussed in 4.1.1 to be an inclusion and therefore the resultant Emergency Outage on No.41 cable should also be included. The outage should therefore be capped at 7 day (168 hours).

4.3.2 Emergency Outage 0-2005-E0008 on 30th September 2005

This outage occurred on the 330kV line no.21 Munmorah to Sydney North with tee to Tuggerah.

TransGrids narrative submission states that " ... *As this aligns with the proposed exclusion of the emergency outage, the corresponding contributions to the Average Outage Restoration Time should be excluded*."

In line with circuit No. 21 exclusion in the Transmission Line Availability calculations, SKM also considers circuit No. 21 should be excluded from the Average Outage Restoration Time calculations.

4.3.3 SVC at Kemps Creek substation

TransGrid suffered an outage of the SVC at Kemps Creek during 2004, as a result of a major failure of the SVC transformer. TransGrid were able to defer the programmed decommissioning of other reactive plant on the network, and applied for an exclusion on the grounds that other sources of reactive capacity had been retained in service. SKM recommended, and ACCC decided, that this event should be capped at 14 days for the purposes of the reactive plant availability measure.

Throughout 2005 the SVC at Kemp Creek Substation has continued to be out of service and TransGrid have considered the outage as a continuation of the 2004 outage and therefore has no outage value allocated against the 2005 performance.

SKM recognises that TransGrid have taken all reasonable steps to return the SVC to service. The failed transformer is an unusual voltage and design, and the original manufacturer no longer has the capability to repair this type of equipment. TransGrid has identified an alternate supplier, placed

an order for its repair, and is currently awaiting the unit to pass electrical tests before it can be returned to service.

On this basis, SKM recommends the 14 day cap from 2004 be continued. However, SKM considers this outage cannot be allowed to continue indefinitely, and a cap on what can be considered a reasonable repair / replacement time should be set. SKM recommends TransGrid nominate an earliest practical return to service date, at which time the 14 day cap will expire and any further delays count towards 2006 outage reporting.

5. Calculation of S-Factors

SKM has checked TransGrid's calculation of its S-Factors for 2005, and re-calculated the S-Factors taking into account its recommendations regarding each of TransGrid's requested exclusions.

These results are shown in the tables below. SKM considers TransGrid has calculated its S-Factors accurately and in accordance with the PI Scheme Guidelines, except where requested exclusions not been included by SKM referred to in section 4 of this report.

- **Table 1 Performance Results**

No	Performance Measure	Target	TransGrid Without Exclusions	TransGrid With All Requested Exclusions	SKM Without Exclusions	SKM With Recommended Exclusions
S1	Transmission line availability	99.5	99.505	99.588	99.505	99.567
S2	Transformer availability	99.0	98.903	98.903	98.903	98.903
S3	Reactive Plant availability	98.6	99.635	99.635	99.635	99.635
S4	Reliability (Events > 0.05 system minutes)	5	2	1	2	1
S5	Reliability (Events > 0.4 system minutes)	1	0	0	0	0
S6	Average Outage Restoration Time (7 day cap per event)	1500	723.45	629.38	723.45	716.73

- **Table 2 Calculated S-factors**

No	Performance Measure	TransGrid Without Exclusions	TransGrid With Exclusions	SKM Without Exclusions	SKM With Exclusions
S1	Transmission line availability	0.005089%	0.088247%	0.005089%	0.067000%
S2	Transformer availability	(0.018167%)	(0.018167%)	(0.018167%)	(0.018167%)
S3	Reactive Plant availability	0.10000%	0.100000%	0.100000%	0.100000%
S4	Reliability (Events > 0.05 system minutes)	0.250000%	0.250000%	0.250000%	0.250000%
S5	Reliability (Events > 0.4 system minutes)	0.20000%	0.200000%	0.200000%	0.200000%
S6	Average Outage Restoration Time (7 day cap per event)	0.10000%	0.100000%	0.100000%	0.100000%
	Total	**0.636922%**	**0.720081%**	**0.636922%**	**0.698833%**

The profiles for each of the applicable measures are shown in Appendix A to illustrate the performance in graphical terms.

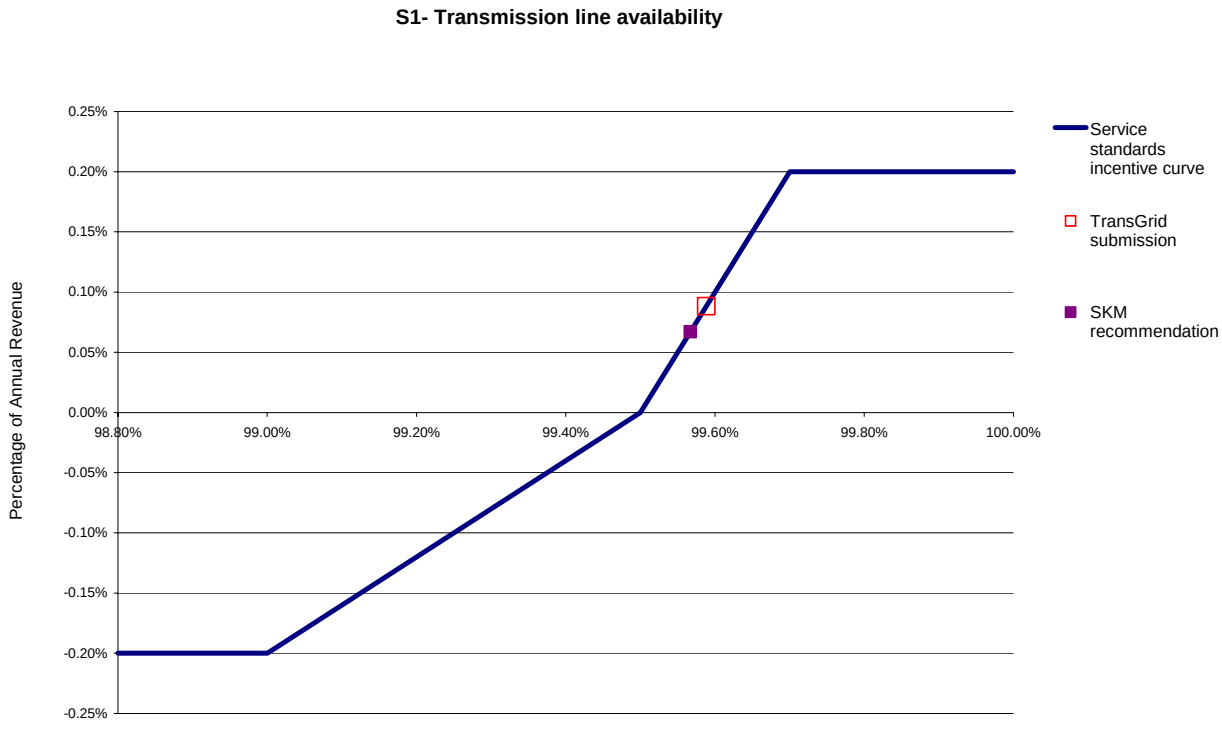
Based on these results, SKM recommends the bonus for TransGrid should be **0.698833% of the agreed Annual Revenue for 2005**.

Appendix A 2005 Performance Measure Profiles

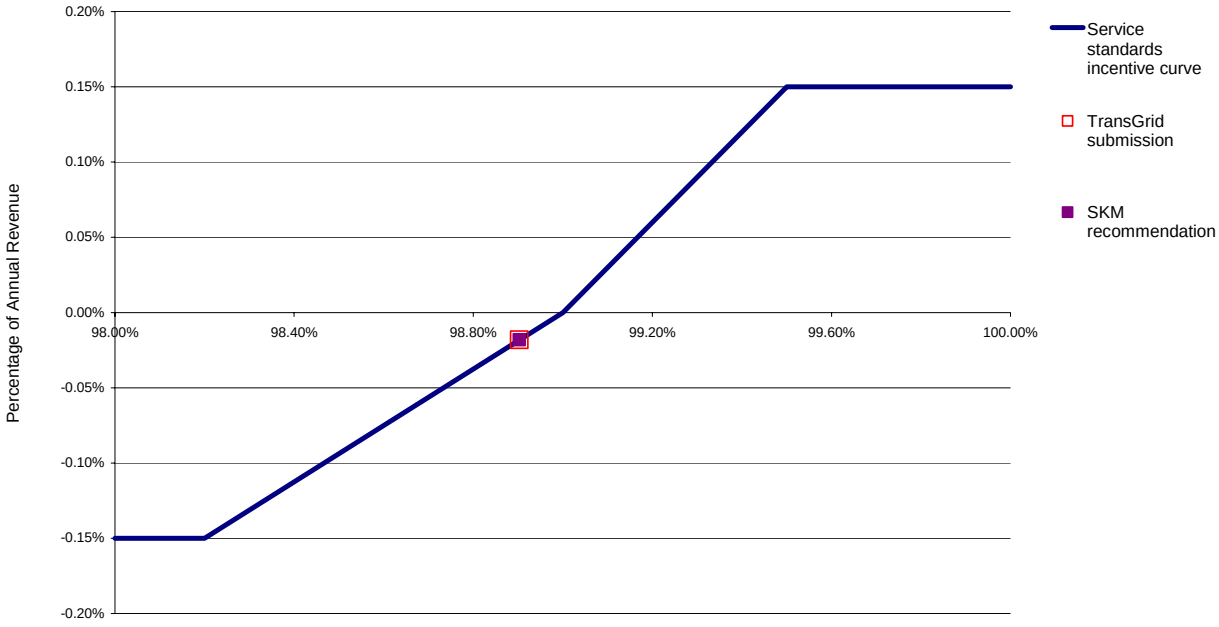
The Performance Measure profiles graphically illustrate the 2005 performance against the targets for availability, reliability and average outage measures.

The profiles shown are:

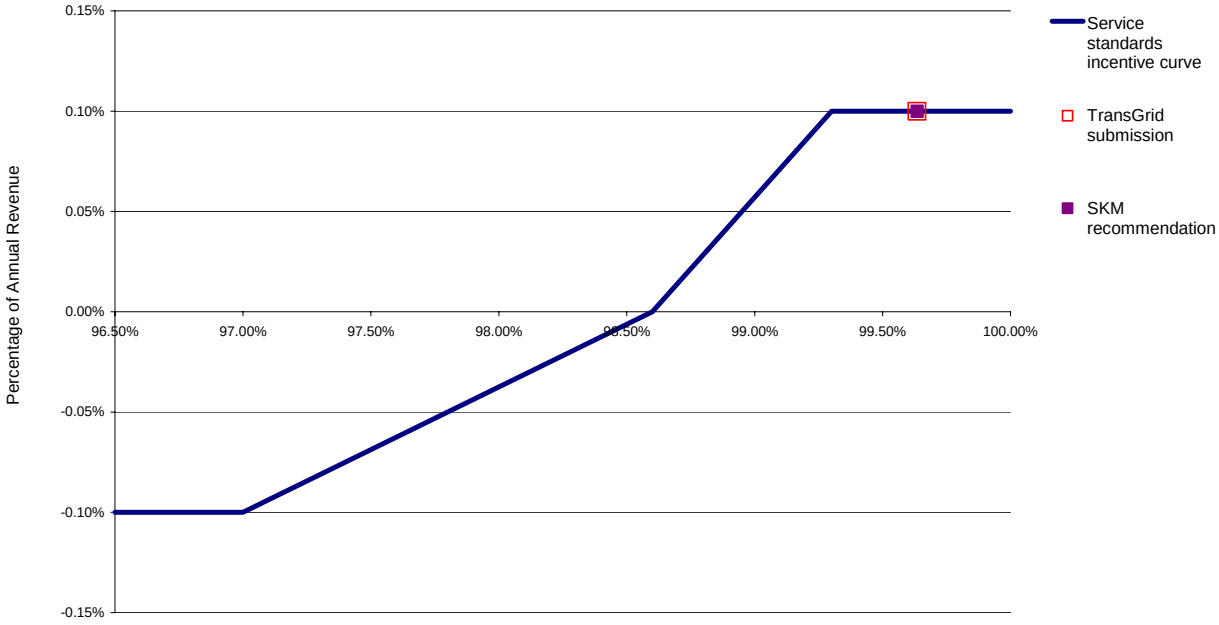
- Transmission line availability
- Transformer availability
- Reactive Plant availability
- Reliability (Events > 0.05 system minutes)
- Reliability (Events > 0.4 system minutes)
- Average Outage Restoration Time (7 day cap per event)



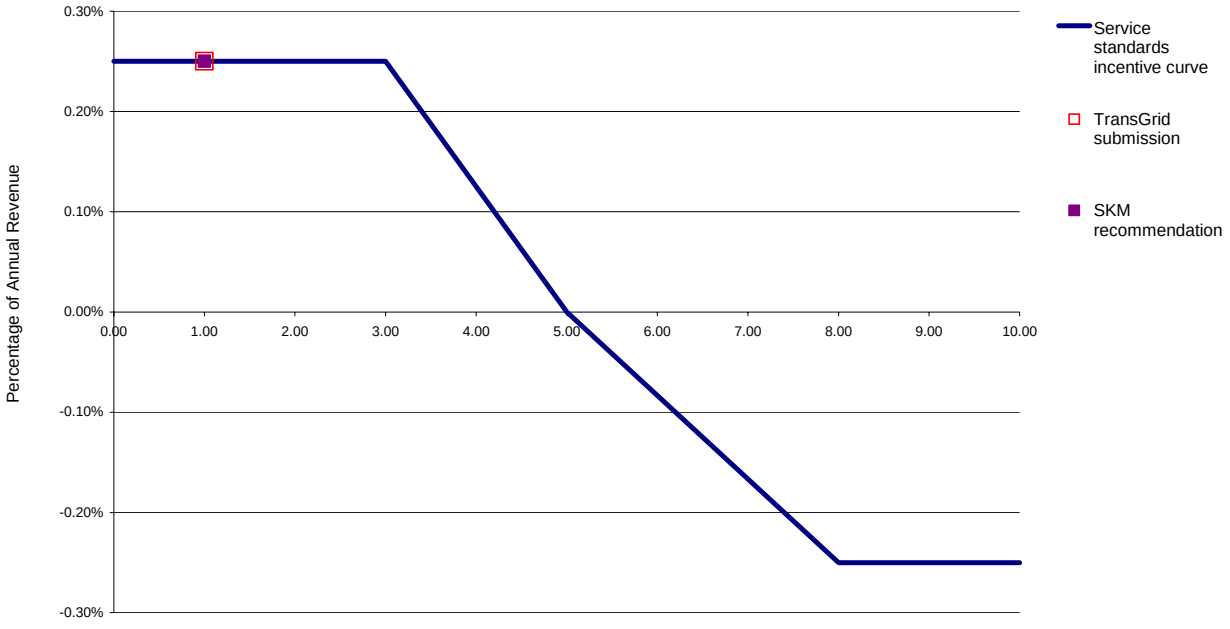
S2- Transformer availability



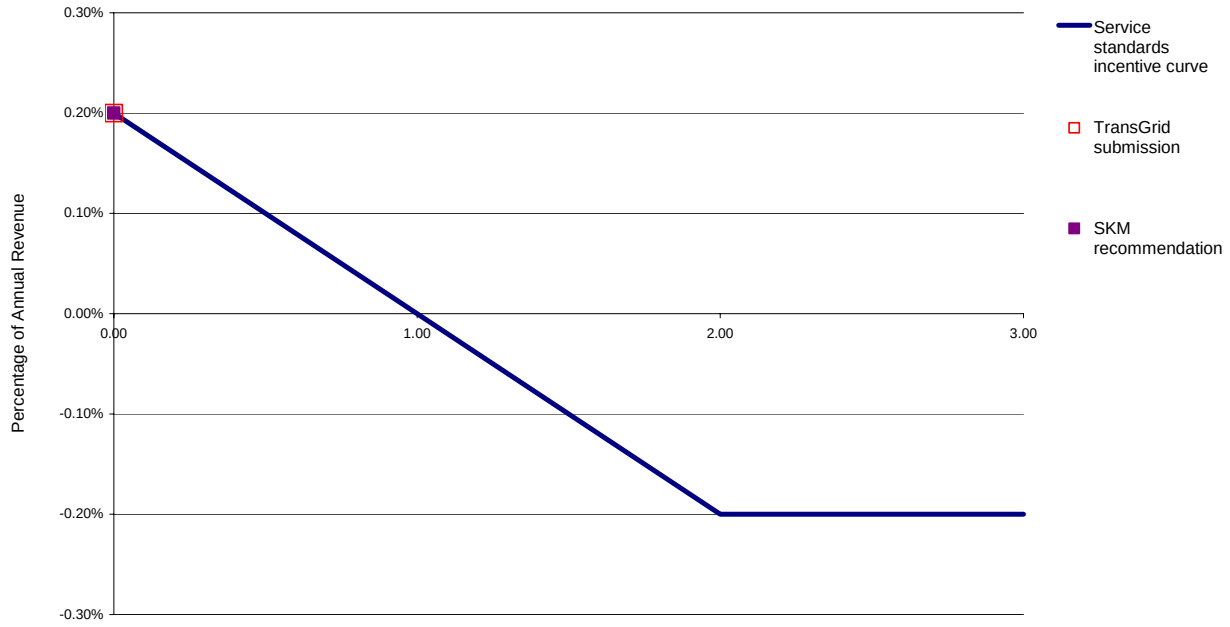
S3- Reactive plant availability



S4- Reliability (Events > 0.05 system minutes)



S5- Reliability (Events > 0.4 system minutes)



S6- Average outage restoration time