Audit of SP AusNet Service Standards Performance Reporting

TRANSMISSION NETWORK PERFORMANCE RESULTS FOR 2009

- Final Report
- 19 Mar 2010

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Executive Summary

Sinclair Knight Merz (SKM) was engaged by the Australian Energy Regulator (AER) to conduct an audit of the year 2010 performance report of SP AusNet (transmission network) based on the service standards established under the AER document "Final Decision – SP AusNet Transmission Determination 2008-09 to 2013-14" dated January 2008.

The audit concentrated on a review of the performance results submitted by SP AusNet, in particular:

- the adequacy and accuracy of the recording system used to measure performance and a review of any changes since previous audits
- the accuracy of the calculations of the final performance; and
- the force majeure events and other exclusions to ensure compliance with the regulatory decision and AER service standards guidelines.

As the auditor, SKM met with SP AusNet staff in Melbourne on 5th and 9th February 2010, to review their data, systems and processes for gathering and processing outage information. The integrity of the system established by SP AusNet for both entry and retrieving of data from the MAXIMO maintenance system for reporting under the AER service standards was audited. SKM specifically review the manual data entry of switching log in the control room to satisfy itself with the robustness of data entry, including completeness and accuracy of the inputs into the MAXIMO. In addition, specific events were reviewed to examine any particular issues associated with the claim for exclusion.

As a result of audit activities undertaken, Sinclair Knight Merz has formed an opinion that:

- the performance reporting by SP AusNet was free from material errors and in accordance with the requirements of the AER service standards guidelines;
- SP AusNet has correctly applied the AER performance incentive model that contain the S-factor equations and coefficients defined in the revenue cap decision to calculate the S-factors;
- the recording system used by SP AusNet to capture the relevant details for outages is accurate and reliable;
- the categorisation of assets within the MAXIMO maintenance system is appropriate and consistent with the categorisation under the AER service standards for critical and non-critical assets;
- the audit of the interface programs between MAXIMO and the performance reporting files found the transfer of data to be accurate and complete;

- the application of exclusions was generally in accordance with AER specification of exclusions for the current regulatory period, which SKM audited and agreed that it formed the basis of the performance targets;

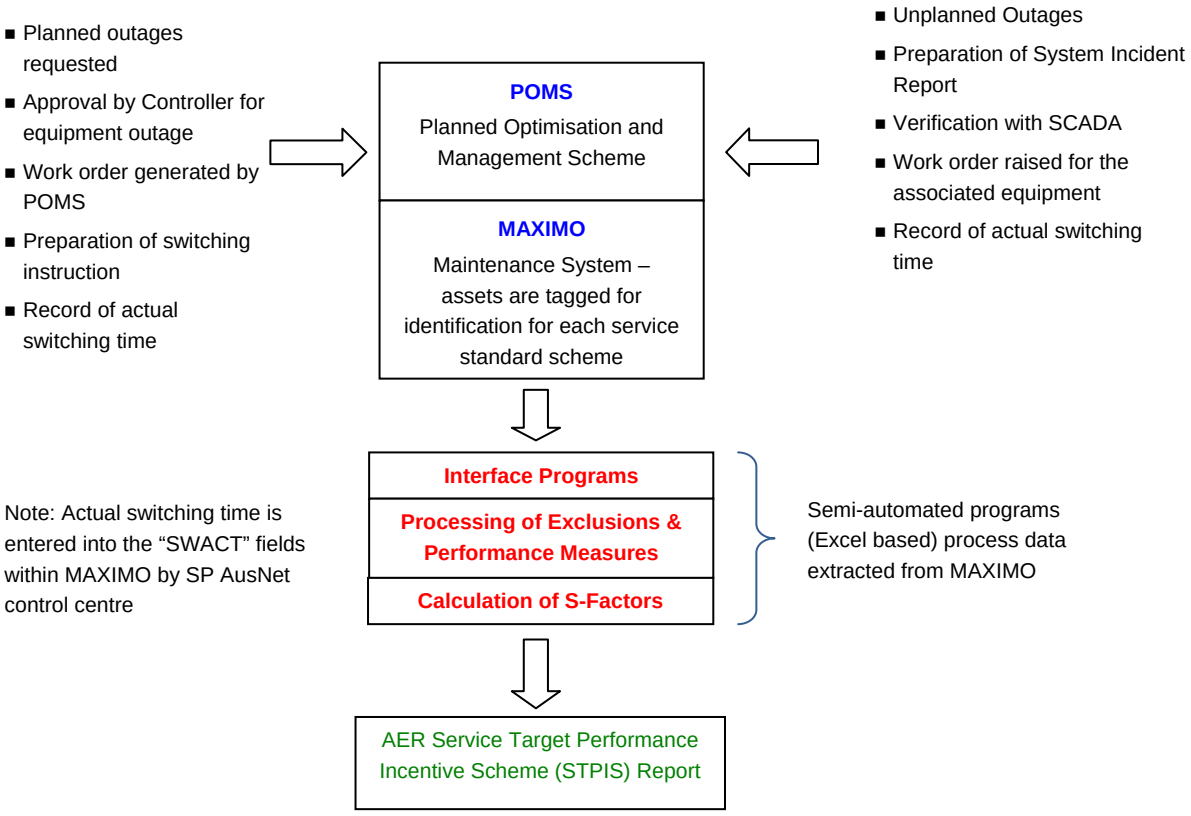
SKM recommends:

- SP AusNet's calculation of its S factor be accepted as free from material errors, subject to the AER's acceptance of the exclusions recommended by SKM; and
- The S-factors for SP AusNet under the AER service standards for 2010 be **0.511300% of the agreed Annual Revenue for 2010**, after making adjustment to the exclusions recommended in this audit.

1. Recording System

An overview of the SP AusNet outage management systems for the AER service performance reporting is shown in Figure 1-1.

- **Figure 1-1 Outage Management Systems for AER Service Performance Report**



The recording and reporting system used by SP AusNet for the purpose of AER service performance report has been in place since 2003, covering both planned and unplanned events to meet the requirements of the AER service target performance incentive schemes (STPIS).

For each planned or unplanned outage, a Works Order is initiated through POMS, detailing the known details of any fault and the nature of work required. A mandatory field has been added to the Works Order so that the reason for the outage is coded (refer section 3.3). This field offers a drop down selection of coding options from which the planner makes a selection. Following the introduction of new service measures and treatment of exclusion events by AER in 1 April 2008, SP AusNet has revised these coding to meet the new reporting requirements based on the revised

performance targets. The coding for Works Orders is reviewed daily by the Works Planning Manager to ensure it is appropriate.

In the MAXIMO maintenance system, each system element has been tagged with identification codes to identify whether it is critical or non-critical to facilitate for reliable data processing. The outage details from POMS are combined with the asset tags to provide a single source of data for reporting to the different performance schemes and statistics as required by the Victorian System Code, Network Agreement with AEMO[1] and SP AusNet internal management.

A semi-automated interface program (Excel spreadsheet based) performs data extraction from MAXIMO, determines event for exclusion or inclusion, and calculates the S-factor results for the AER performance reporting.

1.1. Planned Outage Details

For each planned system outage, there is a System Outage Request form accompanied by a Switching Log and Permits form. The switching times are recorded by the SP AusNet controller and transferred to the relevant Works Order in MAXIMO.

1.2. Categorisation of Outage Reasons and Exclusions

Dependent upon the outage reason code applied to the Works Order, the event may be excluded from consideration under the AER service standards.

Following the revised STPIS that took effect on 1st April 2008, SP AusNet reviewed the categorisation of outage reason code and now maintains altogether 30 reason codes. For the 2009 reporting year, SP AusNet used 13 of them to sufficiently categorised the events in the report. These are summarised in Table 3-3.

Maintenance staff through the POMS system enters the categorisation for an outage at the time of signing off the Work Order. The coding of the event is mandatory, and Works Orders cannot be closed without this information being supplied. The Works Planning Manager and other senior staff review the coding to ensure that the reason for each event has been correctly categorised.

1.3. Processing of Outage Data (Interface Program)

SP AusNet has developed the semi-automated interface program that extracts relevant data from MAXIMO into an Excel spreadsheet for processing performance result and information under the AER service standards. This interface program was developed during 2003/04, and since then

[1] VENCorp was integrated into the Australian Energy Market Operator (AEMO) in 2009

there have been several improvements and modifications made to the program. All the data used for the 2010 performance measure report was extracted using this interface program.

MAXIMO is the single source of database for reporting performance to the AER service standards scheme. The Excel file for the AER service standards results imports data from MAXIMO into a spreadsheet, and then processes the data using Visual Basic to filter only those events that have not been excluded for one reason or another. Within the Excel file, there is a spreadsheet where peak, intermediate and off-peak times are determined, dependent upon the time of year. The information is summarised on a separate spreadsheet where the times in peak / intermediate / off-peak periods are calculated for each event, together with the contribution of each event towards the results of the respective S-factor measures.

In SKM's opinion, the spreadsheet is complex and lacks proper documentation on the rules used to generate reports. Consequently, extra effort is required to explain to an external auditor the functionality and the mechanism behind the report generated.

The spreadsheet is managed and maintained by single resource, and the knowledge of maintenance and usage of the spreadsheet functions and features reside with only two staff members within SP AusNet.
There are concerns regarding the limitations of the spreadsheet as to whether it could handle large amount of data in the future.

SP AusNet advised they are in the process of replacing this Semi-automated Excel based program with a new system that interface with the MAXIMO for AER report. This new system is named Transmission Regulatory Report (TRR) within SP AusNet, and is based on data warehousing technology using the performance management software (Cognos). It is expected that the TRR will minimise the manual adjustments and improve the ease of maintenance, in the event that there are modifications required to the program.

This new TRR system is being developed at the time of writing this report.

1.4. Calculation of Performance Measure Results

The performance measure results are calculated using the AER performance incentive model that contains S-factor equations defined in the SP AusNet revenue caps decision. The results are collated into a graph (see SP AusNet submission) illustrating the S-factors proposed by SP AusNet. SKM has independently calculated the SP AusNet proposed S-factors results to verify their correctness.

1.5. Business Process

SKM observed that the AER service standards has driven significant changes in the business practices within SP AusNet and some of these changes have manifested in the operational aspects as follows:

- The Works Planning Manager was provided access to the interface program to allow for daily reporting to monitor progress and for use in forward planning;
- With the new regulatory period effecting 1 April 2008, SP AusNet personnel were informed and educated about the new AER requirements and the impact that the Scheme may have on performance targets by the production of a "AER Outage Planning Guide";
- Changes were made to the planning process so that planned outages have least impact on the network, particularly in peak periods; and
- Changes in operational processes for workflow control so that unplanned outages may be returned to service more quickly.

2. System Audit Findings

During 2009, there were 1,283 events that were reported to the AER service target performance incentive scheme.

Specifically, SKM focused on the SP AusNet system compliance on current determination based on AER document "Final Decision – SP AusNet Transmission Determination 2008-09 to 2013-14" dated January 2008.

As part of this audit, SKM reviewed the current performance incentive scheme put in place since 1st April 2008 and compared it with the previous price reset. The key changes identified are as follows:

- Increase SP AusNet's revenue at risk from 0.5% to 1% of the Maximum Allowed Revenue (MAR)
- Revised the events for exclusions (i.e. inclusion of DBs, Vencorp and 3rd party augmentation works)
- Adjustments to the service performance targets in accordance with the revised exclusion criterion.
- Introduce two addition target measures (S6 and S7) under the loss of supply events

SKM has in the past (2004 to 2008) conducted random sampling of SP AusNet control room manual records (at 452 Flinders Street) to ensure events are correctly captured and appropriately categorised. In this audit, SKM conducted sampling in excess of twelve (12) records and confirmed that these events were correctly recorded in MAXIMO and correctly transferred to the Excel file for processing. The reason and switching times were found to have been correctly recorded, accurately transferred to the Excel file and correctly processed for the STPIS reports. Likewise forced and emergency (unplanned) events were entered into MAXIMO at the control room, and appropriately captured and reported.
There were minor adjustments required due to daylight saving time because the AEMO's SCADA time is based on Eastern Standard Time (EST). Although this impact to the service performance results was minor, SKM found that the outage period for events involving daylight saving were correctly timed and captured in the MAXIMO switching records.

SP AusNet has provided all the details associated with the 1,283 events for the calendar year of 2009. SKM has further randomly extracted events from these raw data record in the Excel spreadsheet and cross checked against the work orders, the appropriate categorisation for AER reporting, and found no error in the records under review. SKM was satisfied that for each event, a reason code had been entered correctly for the outage, and that the outage reason was in accordance

with exclusion criteria specified in the current AER determination. Consequently, the recording system was found to be satisfactory.

The functionality of the Excel file and the associated Visual Basic code has been subjected to exhaustive testing by both internal SP AusNet staff and contractors. In 2003, SKM reviewed the operation of some of the Visual Basic modules, and was satisfied that they appeared to function correctly. The arithmetic functions on the Excel spreadsheets was checked and found to have been correctly applied.

This audit found that there is integration of the AER's STPIS into MAXIMO and the interface program designed for service performance report, and that the system events are properly accounted for.

SKM is satisfied that the recording and data processing systems that have been put in place by SP AusNet appear to accurately log and calculate service performance.

There were two outages associated with the Murray to Dederang 330kV lines (No. 1 & 2) reported by SP AusNet as outages initiated by TransGrid. SKM has crossed check these events with the TransGrid data and found SP AusNet correctly reported the service performance records. However, in one of the outage event associated with MMS-DDTS No.1 on 4 November 2009, there seems to be an hour time delay after TransGrid returned their switchgear to service at the Murray switching station. Although this is not material, it has not been clear to SKM the reason for closing the switchgear on the SP AusNet end (DDTS) one hour later.

During the audit, there were two records identified with entry errors, and they were reported as follows:

- DDTS – SMTS No.2 330kV at SMTS (rebuild of T493)

This planned outage was required for providing safe access for the cranes to erect the conductor onto the emergency tower on the No.1 line on 12 Feb 2009. As it is a planned outage, it has been incorrectly included in the S8 measure (Average Outage Duration for lines). The outage hour associated is 6.733hrs, and there is no material impact to the performance figures because SP AusNet has claimed for exclusion of this outage event.

SP AusNet has also claimed this event as Force Majuere under the S1 measure (total circuit availability) and the S2 measure (peak critical availability) and SKM considered these entries are correct.

- LYPS-BLLY line 500kV line at LYPS

The outage of this line is not reported in the performance records and SP AusNet agreed that this is an oversight on their part.

However, as this 500kV line is owned by Basslink, the outage is considered a third party, unregulated asset, consequently there is no material impact associated with the performance report.

3. Exclusions

The Transmission Network Revenue Determinations (200809 to 2013-14) established a set of provisions for certain defined events to be excluded from calculated outage figures. These provisions are provided in section 3.1.

3.1. Exclusions defined under Revenue Caps Decision

The exclusions defined under the SP AusNet Transmission Determination (2008-09 to 2013-14) dated January 2008 are as follows:

Parameter 1 Transmission Circuit Availability	▪ Unregulated transmission assets. ▪ Connection assets ▪ Exclude from 'circuit unavailability' any outages shown to be caused by a fault or other event on a '3rd party system' e.g.intertrip signal, generator outage, customer installation (TNSP to provide lists) ▪ Exclude from 'circuit availability (peak critical)' and 'circuit availability (peak non-critical)' any outages of shunt reactors ▪ Outages to control voltages within required limits, both as directed by NEMMCO[2] and where NEMMCO does not have direct oversight of the network (in both cases only where the element is available for immediate energisation if required) ▪ Fault-level mitigation works, except for that associated with JLTS 220 kV Fault Limiting Reactors and Fault Level Mitigation Works at JLTS and MWTS; and WMTS 66 kV Bus Tie Series Fault Limiting Reactor* ▪ Force majeure events
Parameter 2 Loss of Supply Event Frequency Index	▪ Unregulated transmission assets (e.g. some connection assets) ▪ Successful reclose events (less than 1 minute duration) ▪ Any outages shown to be caused by a fault or other event on a '3rd party system' e.g. intertrip signal, generator outage, customer installation ▪ Planned outages
Parameter 3 Average Outage Duration	▪ 3.1 Planned outages ▪ 3.2 Momentary interruptions (duration of less than one minute) ▪ 3.3 Force majeure events

[2] NEMMCO was integrated into the Australian Energy Market Operator (AEMO) in 2009

3.2. Exclusions proposed by SP AusNet during revenue cap application

SKM noted that SP AusNet has, in its submission prior to the current price reset period, proposed outages occurring at the same time as a customer's outage request be excluded. AER's consultant supported this proposed exclusion because such outages meet the standard exclusion criterion and consequently there is no change to the standard exclusion criterion for third party events.

SKM accepts that such co-ordinated outages meet the third party event criterion and accordingly audited SP AusNet performance report on this basis.

3.3. Categorisation of 2009 events

Table 3-1 summarises the overall results by included and excluded events, *including* the consideration of out of service assets.

Table 3-1 Summary of total hours for included and excluded events

Categorisation	Total Hours		Peak Hours		Intermediate Hours		Off-peak Hours	
All Included Events	17,967	52%	244	10%	2,327	60%	15,396	55%
All Excluded Events	16,289	48%	2,184	90%	1,530	40%	12,575	45%
Total	34,256	100%	2,428	100%	3,856	100%	27,972	100%

SKM reviewed the complete list of excluded events in 2009 submitted by SP AusNet to AER as part of the requirements under AER Determination decision. SKM is satisfied that the exclusions, including the connection assets and unregulated assets, were properly categorised and reported.

The total numbers of excluded events were 336, contributing to 16,289 outage hours, or 48% of the total outage time.

Each event was categorised on the Work Order with a reason code for the outage. Where reason code consisted of events that also satisfy the exclusion criterion, a secondary code "ACCC_Type" is used to determine if an event should be excluded. These categories are shown in Table 3-2 together with an exclusion designation. Categories that are marked with an "**x**" are excluded from the calculation of the performance measure data results because they are in general conformance with the exclusions defined under the 2008-9 to 2013-14 determination, except those specifically discussed in this report.

SP AusNet created altogether 30 reason codes, with the description of each reason code provided in Table 3-3.

Table 3-2 Breakdown of Results by Outage Reasons

No.	Reason Code	ACCC_Type	Exclusion	No of Events	Total Hours	Peak Hours	Intermediate Hours	Off-peak Hours
1	APDALCOA	Circuits	x	24	220	10	1	209
2	Bushfire	Circuits	x	9	360	99	0	261
3	DB_Aug	Circuits	-	11	144	0	38	106
		Connection Asset	x	18	164	4	0	161
		Unregulated	x	10	2,818	528	131	2159
4	Fault	Circuits	-	78	434	49	57	328
		Connection Asset	x	22	422	123	20	280
		Unregulated	x	12	3,752	367	330	3056
5	Force	Circuits	-	31	264	16	63	185
		Connection Asset	x	10	22	0	0	22
6	Genco	Unregulated	x	2	499	0	0	499
7	REM_Trip	Circuits	-	5	8	0	0	7
8	SPICAPX	Circuits	-	446	7,923	131	1488	6304
		Connection Asset	x	42	1,914	305	323	1287
		Unregulated	x	3	38	11	0	27
9	SPIMAIN	Circuits	-	338	8,656	28	565	8062
		Connection Asset	x	146	4,264	519	703	3042
		Unregulated	x	19	158	9	22	127
10	SthHydro	Circuits	x	2	18	5	0	13
11	SW_NEM	Circuits	x	6	67	31	0	36
12	TranGRD	Circuits	x	2	13	0	0	13
13	Ven_Aug	Circuits	-	38	539	19	115	405
		Connection Asset	x	4	49	0	0	49
		Unregulated	x	5	1,509	173	0	1336
Total				**1,283**	**34,256**	**2,428**	**3,856**	**27,972**

Table 3-3 Description of Outage Reason Codes

No	Reason Code	Outage Reason Description
1	SPIMAINT	MAINT of SP-AusNet Assets carried out by SP-AusNet or its Agents.
2	SPICAPX	CONSTR funded by SP-AusNet & carried out by by SP-AusNet or its Agents.
3	VEN_AUG	Augmentation works funded by VENCorp and carried out by SP-AusNet or its Agents.
4	DB_AUG	CONSTR funded by a DISTCO & carried out by SP-AusNet or its Agents.
5	GEN_AUG	CONSTR funded by a GENCO & carried out by SP-AusNet or its Agents.
6	FAULT	FAULT - Automatic Trip from Protection. NB.Trips caused by intertrip or backup for a DB or GENCO fault are REM_TRIP
7	FORCED	FORCED outage within 24 hours of alarm or report of plant problem.
8	3RDPARTY	Requested by unconnected Third Parties.
9	TPPROX	Requested by Third party to work in Proximity
10	DBPROX	Requested by DISTCO or its Agent to work in PROXIMITY.
11	LANDOWN	Requested by Landowner or occupier to work in Proximity to lines over his land. No Rebate exclusion during peak.
12	VICROADS	Requested by VICROADS Contractor to work in Proximity
13	APDALCOA	Work by Alcoa or work by SP AusNet during outage initiated by Alcoa.
14	HVCUST	Work by SP AusNet during HV customer plant shutdown.
15	ELECTRAN	Work by SPI during an outage initiated by ELECTRANET or work by ELECTRANET alone
16	GENCO	Requested by GENCO to carry out own works.

No	Reason Code	Outage Reason Description
17	STHHYDRO	Requested by Southern Hydro or AREVA to do work on Southern Hydro assets
18	SNOWY	Requested by Snowy Mountains Control Room
19	TRANSGRD	Requested by TRANSGRID or AREVA working for TRANSGRID. Eg 330kV Caps DDTS, WOTS.
20	BUSHFIRE	Outage requested during bushfire for safety of fire fighters from flashover as fire crosses transmission line.
21	SW_NEM	Switching of network requested / directed by NEMMCO. Eg Reactor switching.
22	REM_TRIP	Remote Trip from a connected 3rd Party system eg intertrip signal from GENCO,DISCO,CUST installation.
23	CONSCON	Element stranded by System Design by the outage of another element for CONSTR by SPI, (or Others eg AREVA for SPI).
24	CONSMAIN	Element stranded by System Design by the outage of another element for MAINT by SPI, Trans-Line combo's, 2A2B Caps
25	CONSTR	Redundant code for outage due to SP AusNet Asset maintenance.
26	INTERCON	Interconnector Constrained by SPI or AREVA for SPI. Not AREVA work for TRANSGRID or ELECTRANET.
27	RECOVER	Outages where rebate is recoverable from a 3RDPARTY.
28	SW_VEN	Switching for VENCORP load shedding. Power Restrictions.
29	FORCMAJ	Force Majeure, Labour dispute, Transformer not repairable on site. Collapse of more than 3 intermediate towers.
30	EXCLUDE	Exclude from NWA and ACCC Performance Measures, eg O.O.S Bay F, and Fut F1 Transf, at SMTS

Source: SP AusNet
Note: The shaded reason codes represent the currently active codes

3.4. Reason (Outage) Code

The events related to AEMO (formerly VenCorp), Distributor's augmentation work, and third party outages are now included in the current determination (previously excluded). SKM selectively sample a number of events related to these events and found that SP AusNet has correctly included these events in the service performance report.

SP AusNet advised that there were 30 reason codes being maintained historically, but for the 2009 performance report, there were only 22 active reason codes available to the Controller. SKM also understands that the number of reason codes for 2010 report may be subject to change.

4. Force Majeure

For the purpose of applying the service target performance incentive scheme, force majeure event means any event, act or circumstance or combination of events, acts and circumstances which (despite the observance of good electricity industry practice) is beyond the reasonable control of the part affected by any such event, which may include, without limitation, the following:

- fire, lightning, explosion, flood, earthquake, storm, cyclone, action of the elements, riots, civil commotion, malicious damage, natural disaster, sabotage, act of a public enemy, act of God, war (declared or undeclared), blockage, revolution, radioactive contamination, toxic or dangerous chemical contamination or force of nature
- action or inaction by a court, government agency (including denial, refusal or failure to grant any authorisation, despite timely best endeavour to obtain same)
- strikes, lockouts, industrial and/or labour disputes and/or difficulties, work bans, blockades or picketing
- acts or omissions (other than failure to pay money) of a party other than the TNSP which party either is connected to or uses the high voltage grid or is directly connected to or uses a system for the supply of electricity which in turn is connected to the high voltage grid
- where those acts or omissions affect the ability of the TNSP to perform its obligations under the service standard by virtue of that direct or indirect connection to or use of the high voltage grid.

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

- Was the event unforeseeable and its impact extraordinary, uncontrollable and not manageable?
- Does the event occur frequently? If so how did the impact of the particular event differ?
- Could the TNSP, in practice, have prevented the impact (not necessarily the event itself)?
- Could the TNSP have effectively reduced the impact of the event by adopting better practices?

4.1. Bushfire

SP AusNet has reported for exclusion the following bushfire related outages:

1) EPS – TTS No.2 220kV
2) DDTS – SMTS No.1 330kV
3) DDTS – SMTS No.2 330kV at DDTS
4) DDTS – SMTS No.2 330kV at SMTS (rebuild of T493)
5) DDTS – GNTS No.1 220kV
6) DDTS – GNTS No.3 220kV
7) SMTS No.1 500kV line at HWTS
8) HWTS - LYPS No.1 500kV at HWTS

Four of the incidents are associated with Kinglake bushfire, one with bushfires in Bunyip State Forrest at Labatouche, and two are associated with the bushfires in Myrtleford area.

SKM has examined these events and our findings are presented below:

4.1.1. DDTS-SMT, DDTS-GNTS and EPS-TTS outages

In mid February 2009 Victoria experienced the worst bushfires in the state's history. A series of bushfires were burning across the state, resulting in the highest ever loss of life from bushfire. As many as 400 individual fires were recorded, and this date has since been referred to as "Black Saturday".

The Kinglake fire was the largest of the many fires burning on Black Saturday, destroying over 330,000ha. It was also the most destructive, with over 1,800 houses destroyed and 159 lives lost in the region.

On 7 February 2009, it was reported that a prevailing northerly wind pushed the Kinglake fire south. At around 17:00hr, the DDTS-SMTS No.1 300kV transmission line experienced two trips but was successfully reclosed. The DDTS-SMTS No.2 and the Eildon to Thomastown (EPS-TTS) lines sharing the easement with DDTS-SMTS No.1, also tripped at 17:22hrs and 17:16hrs respectively.

These line trips are likely caused by the phase to phase flashovers from flame and thick smoke created by the fire.

It was reported by CFA that one tower of the DDTS-SMTS No.1 line collapsed and subsequent investigation by SP AusNet concluded that the collapse of this tower (T493) was due to extreme high speed wind accelerated from a combination of prevailing wind, bushfire convection, and local terrain effects. The high winds caused other damage in the area including fallen trees and widespread debris from buildings.

SKM reviewed the information provided by SP AusNet, including an independent report that confirmed the tower failure mode was identified as buckling by plastic overload, meaning that the tower has been subjected to torsional or compressive stresses to the point it can no longer support the load, and consequently fails by bending. Incidentally, there is no evidence that the tower was damaged by the fire (or high temperature).

The ability for SP AusNet to restore service was hindered by that fact that the area was declared as a crime scene by the Police, and no access was permitted for some days to patrol the easement. The smoke on the easement was too dense for an aerial patrol to be effective. Eventually, an aerial patrol by helicopter was conducted on 9th Feb, which confirmed CFA reports of a tower collapsed at Strathewen (T493).

The collapse of T493 tower caused the outage of the following lines:

- EPS – TTS No.2 220kV
- DDTS – SMTS No.1 330kV
- DDTS – SMTS No.2 330kV at DDTS
- DDTS – SMTS No.2 330kV at SMTS (Rebuild of T493)

The severe bushfires in the Beechworth-Mytleford area caused the outage of the following lines:

- DDTS – GNTS No.1 220kV
- DDTS – GNTS No.3 220kV

On the basis of the severity of these extraordinary events, and circumstances not within reasonable control by SP AusNet, SKM considers they meet the definition of Force Majeure.

Accordingly SKM recommends these events be accepted as exclusion from the 2009 service performance.

4.1.2. Outage of HWTS-SMTS No.1 500kV line

SP AusNet claimed that the bushfires in Bunyip State Forrest at Labtouche caused the outage of HWTS-SMTS No.1 500kV line. Prior to the outage, there were three or four repeated tripping of this line on the same day, but was successfully reclosed.

At 16:35 the line tripped again and went into lockout. SP AusNet explained that there were practical difficulties in returning the line to service because access to patrol the line was not permitted by the DSE Fire coordinator due to ongoing fires on the easement. The restoration of the line was completed at 15:15hrs next day.

SKM noted the LYPS-BLLY500k line also tripped simultaneously.

On the basis of the severity of these extraordinary events, and circumstances not within reasonable control by SP AusNet, SKM considers they meet the definition of Force Majeure.

Accordingly SKM recommends this event be accepted as exclusion from the 2009 service performance.

4.1.3. Outage of HWTS - LYPS No.1 500kV at HWTS

SP AusNet identified that an external flashover of the 500kV CT at Hazelwood Termination Station (HWTS) caused the outage of HWTS-LYPS No.1 500kV line. It was reported that the flashover was the result of pollutants from the rain after the Black Saturday bushfires.

The line was tripped on 4th Mar 2009 22:54 and returned to service 5th Mar 2009 21:55 following cleaning and testing of the flashover CT. However, the line was taken out again on 23:53 to repair an isolator problem. It was finally returned to service on 6th Mar 2009 01:55.

SP AusNet only claimed for exclusion of outage period associated with the line tripping due to CT flashover, i.e. 23.02hours.

SP AusNet has indicated that, although the CT is not washed under a separate cleaning program, it was overhauled on four yearly basis and cleaning is part of the circuit breaker group overhaul. The next overhaul is due on 17 Oct 2011.

Following the 'black rain' fell over the Gippsland area in the late afternoon on Black Saturday, SP AusNet has prepared a response strategy to inspect stations and recommend washing on the basis of inspection. The HWTS was inspected and scheduled for washing. However, as explained by SP AusNet, the washing was not able to carry out because this line is a single switched line, and outage is not available during the hot weather when system demand was high. Subsequently, the

CT flashover occurred on the 4th Mar 2009 at the time of high humidity, resulting the tripping of HWTS-LYPS No1 500kV line.

SKM has surveyed the air quality and rain fall information in the vicinity of HWTS. The air quality provided by the EPA for Traralgon and Morwell station (see Appendix A) appears to indicate good air quality, with the exception of some hours, including the mid night of 7th Feb. The PM10 particles, which is an indicator of air quality impacts from bushfire smoke, was shown to be not significant and that the air quality was considered good most of the time on the 8th, 9th and 10th of February 2009 . There was clear evidence of poor air quality on the 7th February 2009, presumably caused by the bushfire.

From the daily rainfall data provided by BOM (see Appendix B), there were evidence of light rainfall (0.2 to 1mm) on the 7th and 8th of February 2009 in the Traralgon region. It is possible that the pollutants in the air might have been brought down by these rains.

There were subsequent rainfalls of significant scale around 12th and 13th February 2009 (2 to 7mm) as well as 3rd and 4th March 2009 (2 to 5mm).

SKM has analysed this exclusion event in detail based on the facts available and was unable to conclude that the flashover failure of CVT was directly related to the pollutants resulting from the bushfire as claimed. The reasons are as follows:

- SKM has contacted both Bureau of Meteorology (BOM) and Environment Protection Authority (EPA) of Victoria and has been unable to obtain confirmation of 'black rain' falling around the area of Traralgon/Morwell region after the Black Saturday.
- There was a time difference of more than three weeks in between the Black Saturday (7/2/09) and the time of failure (4/3/09). As there were rainfalls of significant magnitude prior to the incident, presumably with high humidity, the CVT didn't seem to have failed.
- If there were pollutants residing in the equipment, SKM considers it would be reasonable to expect that the rainfalls, prior to the incident, would have washed down these pollutants.
- In SKM's opinion, the flashover of electrical equipment is usually due to accumulation of pollutants over time. It is unlikely that the sudden 'one off' increase in pollutants was the main cause of flashover.

In its response strategy following the Black Saturday, SP AusNet inspected the HWTS and recommended washing, presumably to minimise the risk of flashover. SKM was advised that the scheduled washing was not carried out due to inability to put the line out of service during summer peak. SKM is of the view that, whilst the summer peak period may have presented difficulties for a planned outage to carry out the recommended washing, given that the work was deemed necessary

or urgent, it would have been within the reasonable control of SP AusNet to undertake the maintenance over the weekends, where there was an opportunity to bring the line out of service and carry out the washing.

As a result, SKM considers that this event was within the reasonable control of SP AusNet to mitigate the risk, and on this basis, it is recommended that this exclusion not be accepted.

5. Calculation of S-factors

SKM has independently verified the results of S-factor calculation proposed by SP AusNet in its service performance report, and confirmed that SP AusNet has used the AER performance incentive model that contains S-factor equations and coefficients in the revenue caps decision to correctly calculate the S-factors.

Table 5-1 shows comparison of the S-factor results calculated by both SP AusNet and SKM.

Table 5-1 Verifications of SP AusNet's Calculated S-Factors Results

No	Performance Measures	AER Target	SP AusNet's report		SKM's calculation	
			Without Exclusion	With Exclusion	Without Exclusion	With Exclusion
S1	Circuit Availability (total)	98.73%	0.160279%	0.183576%	0.159497%	0.182812%
S2	Circuit Availability (critical)(peak)	99.39%	0.186145%	0.200000%	0.181538%	0.200000%
S3	Circuit Availability (non-critical)(peak)	99.40%	0.05%	0.05%	0.05%	0.05%
S4	Circuit Availability (critical)(intermediate)	98.67%	0.013995%	0.014023%	0.013995%	0.014023%
S5	Circuit Availability (non-critical)(intermediate)	98.73%	-0.006622%	0.010193%	-0.006622%	0.010193%
S6	Loss of Supply Event Frequency (>0.05 mins per annum)	6	0%	0%	0%	0%
S7	Loss of Supply Event Frequency (>0.3 mins per annum)	1	-0.041667%	-0.041667%	-0.041667%	-0.041667%
S8	Average Outage Duration (Lines)	6.367hr	0.090145%	0.090145%	0.081164%	0.081164%
S9	Average Outage Duration (Transformers)	6.867hr	0.014775%	0.014775%	0.014775%	0.014775%
	Total		0.467050%	0.521045%	0.452680%	0.511300%

Based on these results, SKM considers SP AusNet's calculation of its S factor to be free of material errors, and recommends that the financial bonus for SP AusNet under the AER Service Standards Scheme for 2010 is **0.511300% of the agreed Annual Revenue for 2010,** after AER's acceptance of the exclusion recommended in this report.

Appendix A Traralgon Air Quality

QH43509	TRARALGON STATION (Measurement of Air Quality)									
	7-Feb-09		8-Feb-09		9-Feb-09		10-Feb-09		4-Mar-09	
HRS	Air Quality Index	PM10 Particles	Air Quality Index	PM10 Particles	Air Quality Index	PM10 Particles	Air Quality Index	PM10 Particles	Air Quality Index	PM10 Particles
12:00:00 AM	25	20	165	165	30	30	21	21	17	4
1:00:00 AM	25	25	49	49	28	28	30	30	16	4
2:00:00 AM	16	16	24	24	25	25	21	21	18	12
3:00:00 AM	19	19	44	44	22	22	21	21	10	10
4:00:00 AM	24	20	26	20	19	19	22	22	16	2
5:00:00 AM	25	18	18	18	21	21	21	21	15	6
6:00:00 AM	25	20	26	26	26	26	32	32	14	7
7:00:00 AM	29	29	33	33	35	35	29	29	15	11
8:00:00 AM	29	23	18	16	59	49	39	39	14	8
9:00:00 AM	31	28	28	28	31	31	27	27	14	13
10:00:00 AM	30	30	28	28	26	20	30	30	22	22
11:00:00 AM	41	9	40	40	43	43	18	18	23	23
12:00:00 PM	72	72	45	45	35	32	23	23	33	33
1:00:00 PM	49	49	33	33	33	33	20	20	47	47
2:00:00 PM	51	51	35	35	50	42	31	31	34	34
3:00:00 PM	72	72	37	37	81	68	30	30	42	42
4:00:00 PM	99	99	38	38	103	77	34	34	66	66
5:00:00 PM	141	141	25	23	114	74	20	20	19	19
6:00:00 PM	339	Not measured	21	21	100	63	17	17	20	17
7:00:00 PM	305	305	27	27	42	37	20	20	21	19
8:00:00 PM	53	0	30	30	31	31	23	23	22	22
9:00:00 PM	74	74	26	26	44	43	34	34	24	24
10:00:00 PM	80	80	28	28	42	37	27	27	20	17
11:00:00 PM	109	109	27	27	21	21	28	28	17	13

Category	Index range
Very good air quality	0–33
Good air quality	34–66
Fair air quality	67–99
Poor air quality	100–149
Very poor air quality	150 or greater

Appendix B Daily Rainfall Data at Traralgon and Morwell

Daily Data for Traralgon EPA

Site Number 085009 • Locality: Traralgon • Opened Mar 1999 • Still Open • Latitude 38°11'42"S • Longitude 146°31'45"E

Precipitation to 9 am (mm)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Avg	Max	Min	Total	Nbr
Jan 2009	0.2	0.6	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.1	3.0	0.0	4.6	31
Feb 2009	0.0	0.2	0.6	0.0	0.4	0.0	0.0	1.0	0.6	0.0	0.0	6.6	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				0.4	6.6	0.0	11.4	28
Mar 2009	0.0	0.0	0.2	1.8	4.0	0.2	0.0	0.0	0.0	0.0	0.0	0.4	4.4	0.0	14.0	0.6	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6	0.0	0.0	0.0	0.0	0.9	14.0	0.0	27.0	31
Apr 2009	0.0	0.0	0.0	11.0	0.2	2.4	0.0	0.0	0.2	0.0	4.2	0.2	0.0	0.0	2.8	1.6	0.2	0.0	0.0	0.0	0.0	0.0	0.0	1.4	2.8	8.6	10.0	7.4	0.2	0.0		1.8	11.0	0.0	53.2	30
May 2009	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.2	2.0	3.6	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.4	16.0	0.7	16.0	0.0	23.2	31
Jun 2009	0.0	0.2	5.6	0.4	0.0	0.2	0.2	2.0	4.6	16.8	0.2	0.0	0.0	0.0	0.0	2.6	0.2	0.2	0.0	0.0	1.8	0.0	0.2	0.0	0.2	0.0	0.2	0.0	0.0	0.2		1.2	16.8	0.0	35.8	30
Jul 2009	2.8	0.8	12.8	3.8	7.0	0.8	0.0	0.0	0.0	0.0	4.4	4.8	0.0	2.0	0.0	0.0	0.4	0.0	0.0	0.0	0.0	0.2	4.0	0.2	0.0	0.0	0.0	1.8	0.0	1.2	4.8	1.7	12.8	0.0	51.8	31
Aug 2009	0.0	0.6	6.0	0.0	3.4	0.0	7.8	1.8	0.0	0.0	1.2	3.2	3.0	0.0	0.0	0.0	3.2	1.2	0.2	0.0	8.6	2.6	0.0	0.4	22.4	4.2	0.0	0.0	0.2	7.8	0.6	2.5	22.4	0.0	78.4	31
Sep 2009	2.2	0.0	0.0	1.2	3.2	0.0	0.6	1.2	1.4	0.0	0.0	0.0	0.0	3.0	0.2	0.0	1.2	4.0	0.2	0.8	0.0	7.0	0.6	0.6	2.2	21.8	9.2	0.0	—	0.0		2.1	21.8	0.0	60.6	29
Oct 2009	0.0	0.0	0.0	0.0	2.0	2.2	7.6	0.4	0.6	0.2	0.2	0.8	7.6	18.8	14.6	4.6	8.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.2	18.8	0.0	68.0	31
Nov 2009	5.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.0	11.4	0.0	0.0	0.0	7.4	0.0	15.6	8.8		1.9	15.6	0.0	56.6	30
Dec 2009	0.0	0.0	0.0	0.0	0.2	0.0	0.0	6.4	6.6	0.0	18.8	1.4	0.2	1.6	0.0	0.0	0.0	14.2	0.8	0.2	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	1.6	18.8	0.0	50.6	31

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Prepared by Climate Services Centre in the Victorian Regional Office of the Commonwealth Bureau of Meteorology. Contact us by phone on 03 9669 4956, by fax on 03 9669 4977, or by email on climate.vic@bom.gov.au
 Prepared on 19 February 2010

Daily Data for Morwell (Latrobe Valley Airport)

Site Number 085280 • Locality: Morwell • Opened Jan 1984 • Still Open • Latitude 38°12'34"S • Longitude 146°28'29"E • Elevation 55.7m

Precipitation to 9 am (mm)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Avg	Max	Min	Total	Nbr
Jan 2008	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	2.6	0.0	2.8	31
Feb 2008	0.0	0.4	0.4	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	5.6	3.4	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				0.4	5.6	0.0	10.2	28
Mar 2008	0.0	0.0	4.0	4.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.6	0.2	15.8	0.0	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.6	0.2	0.0	0.0	0.0	0.0	1.0	15.8	0.0	30.8	31
Apr 2008	0.0	0.0	0.0	17.4	0.0	0.0	0.0	0.0	0.0	4.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.0	11.0	11.2	12.6	0.0	0.0		2.0	17.4	0.0	60.0	30
May 2008	0.2	0.0	0.0	0.0	0.0	0.0	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.8	1.8	2.6	0.0	0.0	0.0	0.2	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.6	3.2	10.0	0.6	10.0	0.0	20.0	31
Jun 2008	0.0	0.0	0.4	0.0	0.2	0.0	0.8	1.8	0.0	17.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.2	0.0		0.7	17.6	0.0	21.2	30
Jul 2008	0.0	1.4	16.2	5.2	5.6	0.8	0.0	0.0	0.2	0.2	4.8	4.4	0.2	2.6	0.0	0.0	0.2	0.2	0.0	0.0	0.0	0.0	4.0	0.0	0.2	0.0	0.0	1.4	0.0	1.2	5.0	1.7	16.2	0.0	53.8	31
Aug 2008	0.0	0.2	5.6	0.0	3.6	0.0	7.4	0.0	0.0	0.0	0.0	3.2	4.4	0.0	0.0	0.2	3.8	0.8	0.0	0.2	5.0	3.6	0.0	0.0	27.0	4.0	0.0	0.0	0.4	8.4	0.0	2.5	27.0	0.0	77.8	31
Sep 2008	1.8	0.0	0.0	1.2	3.8	0.0	1.2	4.4	2.4	1.2	0.0	0.0	0.2	3.2	0.0	0.0	1.4	6.0	0.0	1.0	0.0	7.4	0.6	0.4	3.2	24.4	16.8	6.8	0.4	0.0		2.9	24.4	0.0	87.8	30
Oct 2008	0.0	0.0	0.0	0.0	2.4	2.4	7.2	1.2	1.0	0.4	0.0	1.4	7.6	18.6	14.6	6.0	11.6	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	2.4	18.6	0.0	75.0	31
Nov 2008	0.0	0.0	0.4	0.6	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	16.0	7.4	0.0	0.0	0.2	9.8	0.2	24.0	8.6		2.2	24.0	0.0	67.4	30
Dec 2008	0.0	0.0	0.0	0.6	0.0	0.0	0.0	6.4	8.2	0.0	20.0	1.2	1.0	0.8	0.0	0.0	0.0	17.0	0.8	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	—	0.0	0.0	1.9	20.0	0.0	56.2	30

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