Independent Audit Report - Reliability Performance Reporting

SA POWER NETWORKS

Independent Audit Report - Reliability Performance Reporting

Revision 0

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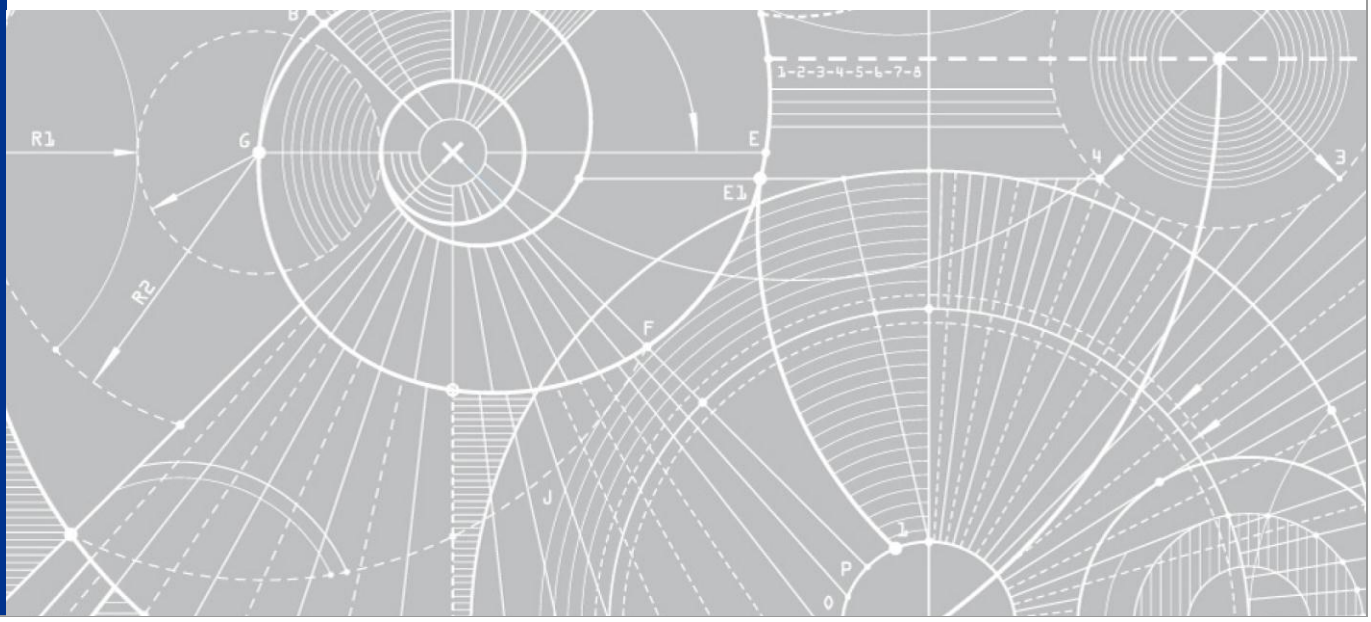
5 September 2014



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Independent Audit Report - Reliability Performance Reporting

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Document history and status

Revision	Date	Description	By	Review	Approved
A	05/08/2014	Draft report for client review	Phillip Webb	Terry Krieg	Greg Whicker
B	31/08/2014	Additional audits of RIN 6.2 and 6.4 as requested by SA Power Networks	Phillip Webb	Greg Whicker	Greg Whicker
0	04/09/2014	Final report with SAPN comments	Phillip Webb	Greg Whicker	Greg Whicker

Important note about your report

The sole purpose of this report and the associated services performed by Jacobs is to audit the SA Power Networks processes used for recording, calculating and reporting network reliability performance for the year 2013/2014 to provide assurance that adequate and effective processes have been developed and are being applied in accordance with the scope of services set out in the contract between Jacobs and the Client. That scope of services, as described in this report, was developed with the Client.

In preparing this report, Jacobs has relied upon, and presumed accurate, any information obtained from established business information systems. Except as otherwise stated in the report, Jacobs has not attempted to verify the accuracy or completeness of any such information. If the information is subsequently determined to be false, inaccurate or incomplete then it is possible that our observations and conclusions as expressed in this report may change.

Jacobs derived the data in this report from information sourced from the Client and/or available in the public domain at the time or times outlined in this report. The passage of time, manifestation of latent conditions or impacts of future events may require further examination of the project and subsequent data analysis, and re-evaluation of the data, findings, observations and conclusions expressed in this report. Jacobs has prepared this report in accordance with the usual care and thoroughness of the consulting profession, for the sole purpose described above and by reference to applicable standards, guidelines, procedures and practices at the date of issue of this report. For the reasons outlined above, however, no other warranty or guarantee, whether expressed or implied, is made as to the data, observations and findings expressed in this report, to the extent permitted by law.

This report should be read in full and no excerpts are to be taken as representative of the findings. No responsibility is accepted by Jacobs for use of any part of this report in any other context.

The audit findings are based on information provided by Rocco Logozzo on Wednesday 23 July 2014 and also information presented to Phillip Webb during his site visit at SA Power Networks on Thursday 24 July 2014 and Thursday 28 August 2014.

This report has been prepared on behalf of, and for the exclusive use of, Jacobs's Client, and is subject to, and issued in accordance with, the provisions of the contract between Jacobs and the Client. Jacobs accepts no liability or responsibility whatsoever for, or in respect of, any use of, or reliance upon, this report by any third party

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Executive Summary

As part of the AER's reporting framework, Network Service Providers (NSP's) are required to provide information and data in accordance with the Annual, Economic, Reset and Category Analysis Regulatory Information Notices (RIN's) issued by the Australian Energy Regulator (AER) in accordance with the National Electricity (South Australia) Law (NEL). Similarly, in accordance with ESCOSA's reporting framework, SA Power Networks is required to provide information and data in accordance with Guideline No.1 - Electricity Distribution.

Accordingly, SA Power Networks has prepared its 2013/14 AER RIN and ESCOSA Operational Performance Report submissions to the AER and ESCOSA.

Given these requirements, Jacobs was engaged by SA Power Networks to audit the non-financial aspects of the AER RIN's and ESCOSA reporting proformas and the associated processes used for recording, calculating and reporting network reliability performance for the year 2013/2014 to provide assurance that adequate and effective processes have been developed and are being applied.

Jacobs has subsequently prepared an audit report to provide assurance, as per the respective AER and ESCOSA requirements.

Audit Scope

The audit was carried out by Phillip Webb (Jacobs, Adelaide) at SA Power Networks premises on 24 July 2014 and included the following:

- The processes for entering and maintaining high voltage (HV) network operations information into a high voltage (HV) interruption database known as the NOC log;
- The processes for entering and maintaining HV interruption data from the NOC Log and low voltage (LV) interruptions into a distribution system job dispatch and outage event capture application known as the Outage Management System (OMS);
- Reviewing in detail the data flow from input to output for 56 interruptions (13 HV and 43 LV) on four randomly selected days (e.g. the data flow from the HV NOC Log through to OMS through to the Business Warehouse reporting system);
- The process for auditing of each month's highest SAIDI interruptions;
- The processes for calculating and reporting reliability performance in terms of SAIDI and SAIFI performance for feeder outages, including specified exclusions for the specified ESCOSA regions and AER feeder categories of the distribution network;
- The process for calculating the Major Event Day exclusion threshold; and
- The processes for calculating the non-financial component of the service performance measures for the Annual, Category Analysis, Reset and Economic Benchmarking RINs (templates 1a, 5b, 5d, 5.2.2, 6.2, 6.3, 6.4 and 7) for the financial year 2013/2014 as part of the Service Target Performance Incentive Scheme (STPIS) of the AER (Australian Energy Regulator).

Reported Data

AER Annual RIN

- 1a STPIS Reliability
- 5b Network Data – Feeder Reliability

- 5d Planned Outages

AER Category Analysis RIN

- 5.2.2 Distribution customer numbers
- 6.3 Sustained Interruptions

AER Reset RIN

- 6.2 Reliability and Customer Service Performance
- 6.4 Historical Major Event Days

AER Economic Benchmarking RIN

- 7 Quality of supply (Economic Benchmarking)

ESCOSA Operational Performance Report Proformas

- ESCOSA Proforma OP 2.1 – System Average Interruption Duration Index (SAIDI)
- ESCOSA Proforma OP 2.3 – System Average Interruption Frequency Index (SAIFI)

Methodology

The audit involved:

- A review of the data submitted;
- Interviews with key staff involved with the reporting process;
- A review of the basis of preparation i.e. documentation and systems;
- Observation of the key procedures used to develop the various reports; and
- A review of information systems and supporting information tools used for reporting and management of data.

Jacobs Findings

Based on the information provided and data examined during the audit, Jacobs is satisfied in all material respects that:

- The data and information presented in the respective AER RINs and ESCOSA reporting proformas have been prepared in accordance with the AER RIN and ESCOSA Guideline requirements;
- The processes for recording network operations and HV interruption data are mature, satisfactory and essentially unchanged from our previous audit (July/August 2013);
- The processes for recording HV and LV interruption data and calculating reliability performance for individual distribution feeders, ESCOSA regions and AER feeder categories are satisfactory;
- The processes for calculating reliability of supply measures are in compliance with established and up to date SA Power Networks Procedures;
- SA Power Networks has adequate processes and information to provide the Supply Restoration and Reliability Standards information to satisfy the requirements of Section 1.1 .3.1 “Service Standards” of the Electricity Distribution Code Issue 10;

- The Reliability of Supply calculations and data by SA Power Networks for the AER STPIS and RINs 1a, 5b, 5d, 5.2.2, 6.2, 6.3, 6.4 and 7 for 2013/2014 are correct, as included in Regulatory Information Notices (RIN) attached in Appendix B;
- The Reliability of Supply calculations by SA Power Networks for the ESCOSA Reliability Service Standards (SAIDI and SAIFI) for 2013/2014 are correct, as included in the Proformas OP 2.1 and OP 2.3 attached in Appendix D; and
- The calculation of the Major Event Day (MED) exclusion threshold for 2013/2014 is correct.

1. Introduction

1.1 Background[1]

SA Power Networks' distribution system supplies power to an area of approximately 178,200 square kilometres (km). The network includes approximately 400 zone substations, 73,600 transformers and 723,000 Stobie poles. The average number of customers for the 2013/2014 financial year was 851,766.

SA Power Networks is a privately owned company required to provide a specified level of service in return for a reasonable commercial return. This outcome is overseen through economic and service regulation, administered by the Australian Energy Regulator (AER) and the Essential Services Commission of South Australia (ESCOSA).

The AER provides incentives for Distribution Network Service Providers (DNSPs) to maintain and improve service performance via a scheme called the Service Target Performance Incentive Scheme (STPIS).

The STPIS establishes targets based on historical levels of performance and provides incentives to DNSPs in the form of financial rewards for bettering targets and financial penalties for a failure to meet targets. It is a requirement of the scheme that the STPIS reporting processes are independently audited annually.

1.2 Scope

The scope of works for this assignment includes audit of the following:

- ESCOSA's Reliability Service Standards [Guideline No.1 under Proformas OP 2.1 (SAIDI) and OP 2.3 (SAIFI)];
- The non-financial information referred to in the AER's Regulatory Information Notice (RIN) as covered by relevant templates (1a, 5b, 5d, 5.2.2, 6.2, 6.3, 6.4 and 7) supplied each year by AER and described in the following table;

RIN	RIN Template Number	Title
Annual	1a	STPIS Reliability
Annual	5b	Network Data – Feeder reliability
Annual	5d	Planned Outages
Category Analysis	5.2.2	Distribution customer numbers by location on the network
Category Analysis	6.3	Sustained Interruptions (Category Analysis)
Reset	6.2	Reliability and Customer Service Performance
Reset	6.4	Historical Major Event Days
Economic Benchmarking	7	Quality of Supply (Economic Benchmarking)

[1] SA Power Networks Annual Report 2013

- The processes, procedures and systems used to prepare and provide this information in accordance with the relevant ESCOSA and AER STPIS requirements for reliability of supply, and with Appendix E of the AER's Regulatory Information Notice in-line with National Electricity (SA) Law.

The audit comprised two key components as follows:

Part 1 - Process and Procedure Review

Auditing of the processes and procedures used by SA Power Networks during the financial year ending 30/06/14 to:

- Enter and maintain the data in the Network Operations Centre (NOC), in-line with the relevant procedure(s);
- Enter and maintain the data in the Outage Management System (OMS) Reporting system, in-line with the relevant procedure(s);
- Prepare, maintain and report the reliability performance results, in-line with the relevant procedure(s); and
- Calculate the Major Event Day (MED) exclusion threshold.

Part 2 - Reliability Service Standards and STPIS Performance Results Audit

Auditing of the accuracy of calculations for SA Power Networks' actual results for the financial year ending 30/06/14 for the relevant AER RIN's and ESCOSA proforma's:

- Reliability Service Standards (SAIDI & SAIFI);
- Outage and Feeder Performance; and
- Service Target Performance Incentive Scheme (STPIS).

1.3 Methodology

The on-site part of the audit for both Part 1 and Part 2 of the scope of works was conducted by Phillip Webb (Senior Executive Engineer - Networks, Jacobs Adelaide) on 24 July 2014, and comprised:

- Interviews with relevant SA Power Networks staff associated with performance reporting:

Rocco Logozzo:	Network Performance & Regulatory Manager (NP&RM)
Michael Edmonds:	Switching Operations Manager (SOM)
Peter Vardon:	OMS Operations Manager (OMSOM)
Grant Cox:	Manager Regulatory Affairs (MRA)
Craig Barnett:	Facilities Information Officer (FIO)

- Part 1 - A review of:
  - Organisation responsibilities, relevant job descriptions and duties of key individuals involved with the STPIS;
  - The processes for entering and maintaining HV network operations information into a HV interruption database known as the NOC log;
  - The processes for entering and maintaining HV interruption data from the NOC Log and LV interruptions into a distribution system job dispatch and outage event capture application known as the OMS;

- The processes for calculating and reporting reliability performance results for SAIDI and SAIFI performance for feeders, including specified exclusions for the specified ESCOSA regions and AER feeder categories of the distribution network;
- The processes for internally auditing and verifying data and calculations; and
- Calculation of the MED exclusion threshold.

- Part 2 - An audit of:
  - Sample input data and reports that produce the Reliability Service Standards;
  - Input data and reports that produce the Outage and Feeder Performance; and
  - Input data and reports for the STPIS.

The audit of data was undertaken using a sample set of days and events preselected by Jacobs.

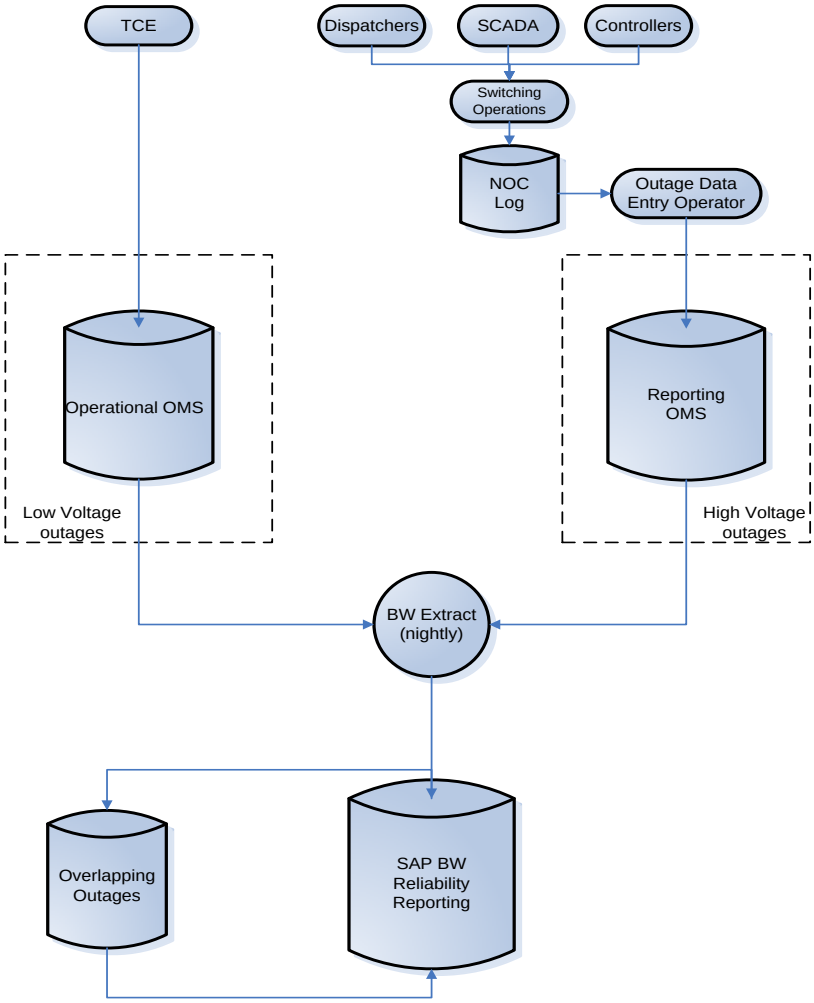
1.4 Information Systems and Processes Overview

There are a number of key information systems supporting the processes for calculating and reporting reliability performance. This section contains an overview of the key information systems involved in managing reliability performance data.

The Operational OMS (OOMS) is designed to capture and store outage event data and to manage the dispatch of jobs to crews.

LV interruptions are captured in real time in the Operational OMS. HV interruptions (switching operations) from the NOC Log are manually entered into the Reporting OMS, generally the day after the outage has occurred (in accordance with Procedure 570 – OMS Data Maintenance) - refer Appendix A for details.

The SAP BW Reliability Reporting System extracts outage data nightly from the Operational OMS and the Reporting OMS via pre-defined standard regulatory reliability reports. After this extraction, outage data is also checked for any overlapping outages before regulatory reporting can be undertaken – refer Figure 1 below:



Legend: TCE – Trouble Call Entry, OMS – Outage Management System, BW – Business Warehouse. NOC – Network Operations Centre

Figure 1 – OMS Overview Diagram

2. AER 2013/2014 Performance Scheme

The STPIS provides incentives for DNSPs to maintain and improve service performance, with the regulatory regime providing incentives to reduce costs where efficient. However, cost efficiencies achieved at the expense of service levels experienced by customers are not desirable. The STPIS establishes targets based on historical levels of performance and provides incentives to DNSPs in the form of financial rewards for bettering targets and financial penalties for a failure to meet targets. The revenue at risk is +/- 3% of annual revenue.

The STPIS has two broad components, the s–factor and the Guaranteed Service Levels (GSL) scheme.

The s–factor comprises three components:

- Reliability of supply;
- Quality of supply; and
- Customer service.

In the Final AER decision in 2010, the AER approved the use of the Box–Cox transformation[2] method by SA Power Networks (then ETSA Utilities) for the purpose of setting the MED boundary in the next regulatory (2010 – 2015) control period. This method is still used by SA Power Networks for determining the MED threshold value.

In 2010, the AER determined that the national distribution STPIS would apply to SA Power Networks in the next regulatory control period (i.e. the current regulatory period) in the following form - the applicable components and parameters are:

- The system average interruption duration index (SAIDI) and system average interruption frequency index (SAIFI) reliability of supply parameters; and
- The telephone answering customer service parameter.

The SAIDI and SAIFI performance targets to apply in each year of the regulatory control period are set out in Tables 1 & 2 below. Any departure from these targets will result in a financial reward or penalty via a distribution revenue adjustment.

[2] The Box-Cox transformation method is a statistical technique used for analysis of datasets that do not exhibit a “Normal” distribution pattern. Using the method the data can be transformed to an approximate “Normal” distribution for the purposes of analysis.

Table 1 - AER decision on SA Power Networks (formerly ETSA Utilities) performance targets - SAIDI (Minutes)

Feeder Category	2010-11	2011–12	2012–13	2013–14	2014–15
CBD	27.1	27.1	27.1	27.1	27.1
Urban	104.4	104.4	104.4	104.4	104.4
Rural Short	184.0	184.0	184.0	184.0	184.0
Rural Long	270.2	270.2	270.2	270.2	270.2

Table 2 - AER decision on SA Power Networks (formerly ETSA Utilities) performance targets - SAIFI (per 0.01 Interruptions)

Feeder Category	2010-11	2011–12	2012–13	2013–14	2014–15
CBD	0.263	0.263	0.263	0.263	0.263
Urban	1.292	1.292	1.292	1.292	1.292
Rural Short	1.736	1.736	1.736	1.736	1.736
Rural Long	2.111	2.111	2.111	2.111	2.111

These targets exclude:

- Transmission / generation / emergency disconnections
- Momentary interruptions (i.e. duration ≤ 1 minutes)
- Customer equipment failures
- Planned interruptions
- Major Event Days (MEDs), a daily SAIDI of > 4.369 minutes was used for setting the targets

3. Audit Observations

3.1 Organisation

3.1.1 General

Organisation within SA Power Networks has remained stable since the previous audit in 2013. The current organisation chart (as at 24 July 2014) and interviews with key SA Power Networks personnel confirm that:

- Mr Rocco Logozzo continues as Network Performance & Regulatory Manager;
- The entry of relevant data for HV events continues to be undertaken by Mr Craig Barnett (Facilities Information Officer) directly into the Reporting Outage Management System (ROMS);
- Mr Peter Vardon continues as OMS Operations Manager and is responsible for the OMS system;
- The entry of data for LV events continues to be undertaken by Customer Service Agent Call Centre operators directly into the Operational OMS (OOMS);
- The data from both the ROMS and OOMS are stored in database form in the Business Warehouse (BW);
- The BW is used to generate standard pre-defined queries for reliability performance reporting purposes, based on filters/queries to define the data sets required to meet the regulatory reporting needs;
- Mr Grant Cox continues as Manager Regulatory Affairs, responsible for Major Event Day Exclusion threshold calculations;
- Mr Matthew Napolitano has recently been promoted and the Network Control Manager position is currently vacant;
- Mr Michael Edmonds continues as Switching Operations Manager responsible for NOC activities;
- A STPIS Steering Committee continues to monitor and manage STPIS and reliability performance and progress, to identify opportunities and threats and to seek strategic management solutions, projects, ideas and innovation; and
- The OMS functionality and accuracy has been previously audited independently by others and is not within the scope of this audit.

The network reliability performance outcomes are derived from pre-prepared report queries on the BW data, superseding the previous manual methods that existed prior to 1 July 2010. Customer numbers for feeder outages are allocated within the OMS.

3.1.2 Jacobs Findings

There have been no material organisational changes in relation to Network Performance Reporting since the previous Jacobs[3] audit (July / August 2013).

There have been minor changes to the network performance recording and reporting systems (reflecting the changed annual AER RIN reporting requirements) to those previously audited by Jacobs and the work continues to be carried out by experienced officers, familiar with the requirements of their roles.

This stability in organisational structure is noteworthy as it ensures consistency of approach in the entire process. The impression gained during the audit was that of a “well-oiled machine” where each person understood their individual role and was well trained and experienced. This is commendable.

[3] Jacobs Engineering Group acquired Sinclair Knight Merz in December 2013.

3.2 Process Review – Network Operations Centre Logs

3.2.1 Description

SA Power Networks operates a Network Operations Centre (NOC) with the role to monitor the status of the distribution system and to take remedial and preventative actions as required to maximise system availability and reliability. System outage events occur due to a number of unplanned and planned events. Outages and other system events are monitored and recorded in an intranet-based information system referred to as the "Daily Log" or the "NOC Log".

The log system is used to classify and record details of all outages and events occurring for the HV distribution system, whether planned or unplanned, and includes brief details of other events that impact on the distribution system (e.g. transmission network faults). The details are recorded initially by NOC operators in a tabulated format including:

- Type of event;
- Substation and/or Feeder affected;
- Estimated number of customers affected;
- Work being undertaken or event cause details;
- Work job number in OMS;
- The Network Switching Plan number and the nature of the work to be carried out, for planned outages;
- Call details - Date time – Caller – Substation – Action or event;
- Protection devices involved in the event;
- The opening and closing times of protection devices; and
- The location and nature of the fault for unplanned outages;

3.2.2 Procedures

SAPN maintains a comprehensive range of procedures covering the operations of the NOC as part of their quality management system. Procedure NOC-020 "DNC L2 Control Room Procedures" specifies the requirements for the recording of system outage events. This procedure remains unchanged since the previous Jacobs audit and was examined as part of this year's audit. This procedure is expected to be re-written shortly into a modern format.

A NOC Log Operating Manual also provides detailed pictorial information for NOC operator use and training.

Phillip Webb (Jacobs) has previously carried out a detailed review of NOC processes & procedures and a compliance audit of the NOC Daily Log and both were found to be satisfactory.

3.2.3 Audit Process

Michael Edmonds (Switching Operations Manager) confirmed that NOC operations staff are familiar with the Daily Log system and its operation and that procedures are in place to ensure timely recording of outage information. He demonstrated the process for recording system events using a selected system event (Jacobs selected the event from a pre-determined list).

A full time training officer has recently been appointed to oversee NOC training. The initial focus will be on Network Access aspects.

The operation and use of the NOC Log system was demonstrated as part of this Jacobs audit.

An interruption was randomly selected for review as part of the audit. The interruption stages, devices operated and data entry were satisfactorily explained. The NOC log was completed in accordance with procedure NOC-020 and the NOC Log Operating Manual.

To check the accuracy of manually entered operating times, Jacobs cross-checked the selected NOC Log entry against automated SCADA data. For consistency, one of the prior selected events was chosen – namely SCADA alarms for an event on 4/1/14 starting at 04:29, restoration 08:20 at W04 – Elliston 11kV. The outage was checked for agreement of times from the NOC log to OMS and ultimately in the audited final data set. The operating times for devices in the SCADA and NOC log were consistent.

Audit tracking was tested and observed to be working satisfactorily. Although entries can be changed at a later date, no changes can be made without audit tracking of the person making the change and the time the change occurred.

3.2.4 Jacobs Findings

The SA Power Networks processes for recording system outage events are mature, robust and essentially unchanged since previous audits undertaken. In addition, it was noted that:

- The entry process and the NOC Log information system provide adequate levels of outage records;
- Procedures exist to adequately define the process to be used by operators;
- Adequate procedures exist to define steps to be undertaken in entering data;
- Data entry is timely and precise in recording the customer outage times;
- NOC staff are familiar with the system and its use; and
- Appropriate audit tracking is available in the system to record any changes to the Log entered by NOC staff following the system events.

3.3 Process Review – Reporting Outage Management System

3.3.1 Description

The NOC log is used to provide data entered into the Reporting OMS (ROMS) for reporting of HV outages. The Facilities Information Officer (FIO), Craig Barnett reviews the NOC Daily Log and enters details of each HV supply interruption into the Reporting Outage Management system (ROMS).

The ROMS is a computer based system that links to the distribution network topology held in a GIS system so that it is an accurate representation of the connectivity of SA Power Networks' HV distribution system at the time of the event and:

- Contains the current network connectivity condition, including updated abnormal connectivity caused by temporary network conditions / reconfigurations;
- Identifies customer counts at each node on the network via links to customer National Metering Identification (NMI) numbering;
- Contains point of supply and intra feeder open point information; and
- Provides the ability to simulate switching device status (open or closed) and calculates the impact on customers in terms of customer numbers and duration.

GIS data is used to update the OMS data on a 2 to 3 monthly basis.

In operation, the FIO ensures that the ROMS network represents the current status, including abnormal configuration, and then enters details of each event into the ROMS system including:

- Job reference numbers (e.g. NOC Log ID);
- The source substation / feeder name and number;
- The date and time (start and finish time) of the interruption;
- The outage cause code for the interruption;
- The operating protective device numbers and time of opening and closing of switching devices involved during the restoration stage(s); and
- A revised OMS version 8.2 has resolved the manual requirement for checking for duplicate outages affecting the same customer(s) to prevent double counting.

The ROMS then automatically calculates;

- The number of customers affected by the operation of each protection device;
- The total number of customers affected; and
- The total number of customer minutes resulting from the event.

3.3.2 Procedures

The overall STPIS (SPS) reporting process is defined in Procedure 608 issued in 1 March 2013. This procedure describes the entire process for the preparation of annual reports and is authorised by Manager Network Standards & Performance (Jehad Ali).

SA Power Networks Procedure No. 570 "OMS Data Maintenance" was revised on 1/4/2014 and WI-570.01 and WI-570.02 detail the responsibilities and processes for recording and data auditing of the OMS system. WI-570.03 details the processes for recording OMS abnormalities and WI-570.04 the processes for OMS data migration. An additional procedure is now referenced, namely Procedure 109 –"Archiving of Documents onsite & off site". Note that the work instructions were not observed during the audit as they are essentially unchanged from previous audits.

SA Power Networks Procedure No. 605 “Monthly Reliability Performance Reporting” details the responsibilities and process for monthly reporting and data quality reviews. Procedure 605 was updated on 1 February 2013.

SA Power Networks Draft Procedure No. 609 “Feeder Mapping Process” details the process for mapping feeders into their respective ESCOSA or AER (Steering Committee on National Reliability Reporting Requirements - SCONRRR) categories. Procedure 609 was updated on 1 July 2014.

3.3.3 Audit Process

Jacobs conducted an audit of four randomly selected days and associated daily NOC Logs to assess the accuracy of the information calculated and transferred by the FIO to the ROMS database. For each of these daily logs, all events were reviewed in detail to check planned and unplanned events. This included a check of customer outage times and calculated outage minutes, as recorded in the OMS. Examining all outage events on these dates provided a check of a wide variation in geographical locations, seasonal variations, event types (planned and unplanned) and numbers of customers affected.

Thirteen HV interruptions were examined in detail for the following dates and events. Dates were selected to be a cross section of seasons and weather conditions:

i. **27 July 2013**

Interruption – Montacute 11kV – Vegetation: tree branch on mains
Interruption – Sherrifs Road 11kV – Vegetation: tree branch on mains
Interruption – Sherrifs Road 11kV – Transformer Tap position changed due to low voltage
Interruption – Koppamurra 11kV – Vegetation (vine pruning) on mains
Planned NSP – Camden Park 11kV – Network Access Permit
Interruption – Pt Noarlunga 11kV – Transformer failure

ii. **29 December 2013**

Interruption – Back Valley 11kV – Vegetation: Tree branch on mains

iii. **4 January 2014**

Interruption – Yahl 11kV – Animal: suspect birds
Interruption – Elliston 11kV – Insulator failure
Interruption – Perponda West 19kV SWER – LV joints
Planned LSP – Merriton South 19kV SWER – LV tapping
Planned NSP – Elizabeth West 11kV – Network Access Permit

iv. **20 April 2014**

Interruption – Strathalbyn East 11kV –Faulty live line taps

Jacobs reviewed the SA Power Networks distribution feeder allocation tables that define, for each feeder, the ESCOSA development area or AER SCONRRR category allocated. The allocation appeared to be correct from the Jacobs knowledge of the SA Power Networks distribution feeders presented and were determined in-line with Procedure 609 – Feeder Mapping Process.

NP&RM demonstrated the process for the SA Power Networks internal Monthly Reliability Performance Reporting procedure including the self-auditing process for the top 10 major interruptions (by customer minutes) for the month. Jacobs observed that any anomalies found were followed up with the person responsible for data entry and any corrections resulted in changes made to the data. An example of a minor anomaly was requested and noted (refer “Email Logozzo to FIO 20/4/2014”).

3.3.4 Jacobs Findings

The key observations were:

(i) The processes used to record and calculate the STPIS (SPS) data are robust and are defined by appropriate procedures;

(ii) The methodology for recording data from the NOC Logs into the Reporting OMS was applied consistently and no data entry errors were identified for the outage events examined;

(iii) Data for each HV event are recorded into the ROMS that provides the relevant data fields to permit filtered queries and accurate calculation of SAIDI, SAIFI including the relevant exclusions (transmission/generation/emergency, momentary interruptions, planned interruptions, customer's equipment fault);

(iv) The FIO follows up any inconsistencies and anomalies during event analysis to ensure high accuracy in the data. The role of the FIO is an important one in ensuring accuracy of the data entry process and in improving data quality:

(v) The BW reports for these events were examined as a check of the OMS data entry and were found to accurately contain the event details;

(vi) The customer minutes are automatically calculated in OMS using the total (i.e. active (energised) and de-energised) customers at the date of the event and then extracted into the BW for each event for reliability reporting. Active customer numbers can change from time to time due to disconnections, re-connections and new connections and therefore, the BW customer numbers associated with an interruption of supply (which are based only on active customers) will sometimes vary slightly from the OMS customer numbers. A check of the SAIDI for the specific events during the audit showed no material variations of the number of customers impacted between OMS and the BW reports. In past audits minor variations were noted caused by the OMS using all the connected customers on the day that the report is run (active and de-energised) and BW only using active customer numbers for an interruption of supply. The only record of active customers for the actual event is stored in the BW record and there is no independent record or archive, as this is not considered practical from an IT point of view due to the large number of customer records that would need to be managed on a daily basis;

(vii) The Network Performance and Regulatory Manager carries out monthly audit checks of interruptions involving the top 10 major interruptions "by customer minutes" (i.e. generally > 20% of the customer minutes);

(viii) The feeder allocations appear to be correct in accordance with the ESCOSA and AER categories and were determined in-line with Procedure 609 – Feeder Mapping Process;

(ix) In the 2012/13 audit report it was observed that some interruptions (mainly planned) (around 0.06% of customer minutes) were assigned a cause code of 'Not assigned' by personnel in the Operational OMS. The figure for 2013/2014 is 0.09%;

(x) In previous audits it was observed that some customers were not assigned to their respective feeder categories. At the end of the 2012/2013 regulatory period this value was 4 in 844,153, For the 2013/2014 regulatory period this value has dropped to nil; and

(xi) The Monthly self-auditing process associated with management reporting of performance appears robust and effective in identifying and correcting any potential anomalies and evidence was provided of issues followed up by NP&RM.

The SA Power Networks processes for recording HV interruption data are comprehensive and adequate and satisfy the requirements of the Electricity Distribution Code, Section 1.1.1. “Compliance and Record Keeping”.

3.4 Process Review – Operational Outage Management System

3.4.1 Description

This section examines the process for the entry of LV network event data into OMS.

Low voltage events on the SA Power Networks distribution network can only be reported by customers or members of the public, as there is no SCADA monitoring of these parts of the network.

The details are recorded in the Operational Outage Management System (OOMS).

3.4.2 Procedures

The basic procedure is as follows:

- Customer calls are routed to the Call Centre where a Customer Service Agent (CSA) takes the verbal details of the event;
- The call details are entered as a Job into a dispatch system called I-Dispatcher and field crews are notified via a mobile field data terminal called I-Mobile Trouble Centre (I-Mobile TC);
- The field crews attend to the customer problem and complete the job. Final details of the work are entered into the I-Mobile TC terminal and that data is transferred back to the central data storage (SAP);and
- Overnight, the Business Warehouse system extracts the previous day’s outage records from SAP.

The process of generating a trouble call record and dispatch of field crews continues to use the I-Dispatcher and I-Mobile TC systems. Data included in the system includes location, caller information, job cause and details and outage and restoration dates / times.

A trouble call analysis module ensures that multiple customer calls related to the same fault are grouped together under the auspices of one job number to prevent duplication.

During 2011/2013, the I-Dispatcher and I-Mobile TC software was upgraded to version 8.2 from Version 7.94. There were no further changes in 2013/2014[4].

[4] Peter Vardon, 13 August 2014

3.4.3 Audit Process

The LV operations for forty three (43) interruptions associated with the following randomly selected dates were examined and checked that they exist in the BW reports:

Table 3 - Summary of LV Outages Selected for Audit

Outage Date	No. of LV Interruptions
27/7/2013	21
29/12/2013	6
4/01/2014	7
20/04/2014	9
Total	43

Outage commencement and restoration times were checked and found to be accurate. Causes appear to have been accurately reported in the BW reports and excluded events where required have been excluded from SAIDI and SAIFI totals. Excluded events cover events such as customer faults, transmission and generation failures, emergency disconnections using statutory powers, interruptions less than or equal to 1 minute, planned interruptions and MED interruptions. Customer numbers were as expected for low voltage events.

The OMS has previously been audited by GHD and therefore the functionality, reporting system accuracy and network data linkages (e.g. customer to assets) were not included within the scope of the Jacobs audit.

3.4.4 Jacobs Findings

The process for receiving, reporting and recoding low voltage customer trouble calls is satisfactory, mature and utilises modern technology to dispatch jobs and record data from the event.

LV entries for specific days were checked and matched records in the BW reporting system.

3.5 Process Review – Business Warehouse Reliability Performance Reporting

3.5.1 Description

The data for HV events are manually entered into the Reporting OMS and all details of closed events are extracted into a database known as the Business Warehouse (BW).

The data for LV events are automatically entered into the Operational OMS (via the TCE and Toughbooks) and all details of closed events are also extracted in the BW.

Pre-defined tested and change protected queries have been written to enable users to extract standard reliability reports or the required data from the BW, including all performance reports and RIN data as required by ESCOSA and the AER. The accuracy of these reports has been previously reviewed by GHD and found to be satisfactory.

3.5.1.1 Reported Data

AER Annual RIN

- 1a STPIS Reliability
- 5b Network Data – Feeder Reliability
- 5d Planned Outages

AER Category Analysis RIN

- 5.2.2 Distribution customer numbers
- 6.3 Sustained Interruptions

AER Reset RIN

- 6.2 Reliability and Customer Service Performance
- 6.4 Historical Major Event Days

AER Economic Benchmarking RIN

- 7 Quality of Supply (Economic Benchmarking)

ESCOSA Operational Performance Report Proformas

- ESCOSA Proforma OP 2.1 – System Average Interruption Duration Index (SAIDI)
- ESCOSA Proforma OP 2.3 – System Average Interruption Frequency Index (SAIFI)

3.5.2 Procedures

SA Power Networks Procedure No. 613 “Compliance with the AER’s RIN” and Procedure 607 “Compliance with ESCOSA’s Electricity Industry Guideline No1” details the responsibilities and processes for running the BW reports to generate the required AER RINs and the ESCOSA proformas.

3.5.3 Audit Process

Jacobs observed the use of the pre-defined queries on the BW data and was given a BW extract for all data associated with distribution network events for the previously selected days (refer 3.3.3 and Table 3).

- 27 July 2013
- 29 December 2013

- 4 January 2014
- 20 April 2014

Jacobs checked this data against the NOC logs and LV event records, including times, dates, duration, causes, type of interruption and feeder category against ESCOSA and AER categories. The data were found to be accurate.

Annual RIN

- The draft AER RIN 1a STPIS Reliability data were checked against the associated BW reports and were found to be correct;
- The draft AER RIN 5b Network Data – Feeder Reliability were checked against the associated BW reports and were found to be correct.
- The draft AER RIN 5d Planned Outages was checked against the associated BW reports and was found to be correct. Energy Data was excluded from the audit;
- The STPIS (SPS) performance 2013-14 FINAL for Jacobs Review (Confidential) spreadsheet and calculations was checked against the associated BW reports and AER 2013/14 performance targets and found to be correct.

Category Analysis RIN

- The draft AER RIN 5.2.2 Distribution customer numbers by location on the network was checked against the associated BW report and was found to be correct;
- The draft AER RIN 6.3 Sustained Interruptions was checked against the associated BW report and the randomly selected HV and LV interruptions and was found to be correct;

Reset RIN

- The draft AER RIN tables 6.2.1.and 6.2.2 were checked against the data contained in the file titled "AER SA Power Networks 2008-13 Category analysis RIN Consolidated – 12 June 2014 – PUBLIC" that was downloaded from the AER web site. For the 2013/2014 financial years, the draft RIN was checked against the SA Power Networks 2013/2014 data from RIN 6.3 - Sustained Interruptions. The SAIDI and SAIFI by year by feeder category and totals were separately extracted from the relevant files using the relevant included and excluded events and checked against the Draft RIN and found to be correct. The 2014/2015 future estimated values are the AER target figures.
- The draft AER RIN 6.4 contains historical data that has been previously audited by other consultants and the 2013/2014 data has been audited in this review with the data contained in file:"SPS Performance_2013-14_FINAL for SKM REVIEW (Confidential).xls". 12 specific days were selected to validate the data transfer into the draft RIN. These days were the first day of each month from 1/7/2008 to 1/6/2009. The whole of network SAIDI was summated for interruptions on each of these days using the appropriate inclusions and exclusions and the daily totals compared against the draft RIN. Each day's data matched the Draft RIN entries.

Economic Benchmarking RIN

- The draft AER RIN 7 Quality of services was checked against the associated BW report and was found to be correct. The Energy not supplied calculations were checked against the total annual energy distributed to SA Power Networks customers. The annual energy value was not audited as part of this

review, but is in line with what has been reported to the local Regulator (ESCOSA) in SAPN's Annual Operational Performances Report. The duration of supplied energy was calculated by subtracting the planned and unplanned SAIDI from the total minutes per annum to provide the average energy supplied per minute. This value was then applied to the planned and unplanned SAIDI minutes to calculate the energy not supplied.

ESCOSA Proformas

- The draft ESCOSA Proforma OP 2.1 – System Average Interruption Duration Index (SAIDI) was checked against the associated BW report and was found to be correct;
- The draft ESCOSA Proforma OP 2.3 – System Average Interruption Frequency Index (SAIFI) was checked against the associated BW report and was found to be correct.

3.5.4 Jacobs Findings

The draft AER RINs 1a, 5b, 5d, 5.2.2, 6.2, 6.3, 6.4, 7 and ESCOSA Proforma OP 2.1 and OP 2.3 appear to be satisfactory. The STPIS (SPS) performance 2013-14 FINAL for Jacobs Review (Confidential) spreadsheet appears to be satisfactory.

3.6 Process Review – Major Event Day Exclusion Threshold

3.6.1 Description

Section 3.3(b) and Appendix D of the STPIS Initial / Final Decision of November 2009 states that any day where unplanned SAIDI exceeds the major event day (MED) boundary may be excluded from the performance statistics.

An MED is a day on which natural events cause customer supply loss that is more than 2.5 standard deviations greater than the mean of the log normal distribution of five regulatory years' SAIDI data. The AER has approved the use of the Box-Cox transformation method for the purpose of setting the MED boundary for SA Power Networks (refer to the Distribution Determination 2010/11 – 2014/15 dated May 2010).

The MED exclusion does not apply to the reporting requirements of the SA Distribution Code.

3.6.2 Procedures

SA Power Networks Procedure No. 614 "MED threshold calculation threshold for the STPIS (SPS)" details the responsibilities and process for the annual calculation of the MED. The procedure appears to be satisfactory and should be finalised and issued.

3.6.3 Audit Process

Mr Grant Cox, Manager Regulatory Affairs is responsible for this calculation and was able to demonstrate the Excel spread sheet that is used to calculate SA Power Networks' MED. The MED threshold was calculated to be 5.628 minutes of daily SAIDI for 2013/2014. Eight days were identified over the MED threshold for 2013/2014, as listed in Table 4.

Table 4 - Days MED Threshold Exceeded

Date	Minutes
18/7/2013	9.1
30/9/2013	7.6
20/12/2013	7.2
21/12/2013	13.4
14/1/2014	6.0
17/1/2014	6.7
4/2/2014	62.3
23/6/2014	7.1

The STPIS Final Decision requires that the MED is derived from a log normal distribution of 5 years SAIDI and provides the Distributor with the ability to use an alternative data transformation method where the log of the data is not normally distributed. An independent statistician engaged by SA Power Networks found that a logarithmic transformation did not produce a normal distribution, however a normal distribution could be obtained with a Box-Cox transformation. That method has been adopted by SA Power Networks for calculating MEDs with the approval of the AER.

During the previous audit, SA Power Networks advised that an identical result was achieved from the MS Excel tool used by SA Power Networks and a different calculating medium used by an independent consultant.

This correlation was achieved once again for the 2013/14 year, confirming that the MS Excel tool used by SA Power Networks provides an accurate method for calculating the MED threshold.

3.6.4 Jacobs Findings

Jacobs confirms that the basis of the calculation of SA Power Networks' MED of 5.628 minutes for 2013/2014 appears sound.

Jacobs observed that the RIN Templates correctly exclude interruptions occurring on MED days.

The draft procedure 614 (Draft 1 July 2014) should be issued as a final version and with a suggested review period of 36 months.

4. Summary Findings

Jacobs has audited SA Power Networks' processes for network reliability performance reporting, covering:

- The processes for entering and maintaining HV network operations information into a HV interruption database known as the NOC log;
- The processes for entering and maintaining HV interruption data from the NOC Log and LV interruptions into a distribution system job dispatch and outage event capture application known as the Outage Management System (OMS);
- Reviewing in detail the data flow from input to output for 56 interruptions (13 HV and 43 LV) on four randomly selected days (e.g. the data flow from the HV NOC Log through to OMS through to the BW reporting system);
- The process for auditing of each month's highest SAIDI interruptions;
- The processes for calculating and reporting reliability performance in terms of SAIDI and SAIFI performance for outages and feeders including specified exclusions for the specified ESCOSA regions and AER feeder categories of the distribution network;
- The process for calculating the MED exclusion threshold;
- The processes for calculating the non-financial component of the service performance measures for the Annual, Category Analysis, Reset and Economic Benchmarking RINs (templates 1a, 5b, 5d, 5.2.2, 6.2, 6.3, 6.4, 7) for the financial year 2013/2014, as part of the Service Target Performance Incentive Scheme (STPIS) of the AER (Australian Electricity Regulator);
- The processes for calculating the STPIS (SPS) performance for 2013/2014; and
- The processes for calculating the ESCOSA Reliability Performance Proforma's OP2.1 and OP2.3.

Based on the information provided and data examined during the audit, Jacobs is satisfied in all material respects that:

- The data and information presented in the respective AER RINs and ESCOSA reporting proformas have been prepared in accordance with the AER RIN and ESCOSA Guideline requirements
- The processes for recording network operations and high voltage interruption data are mature, satisfactory and essentially unchanged from our previous audit (July / August 2013);
- The processes for recording high voltage and low voltage interruption data and calculating reliability performance for individual distribution feeders, ESCOSA regions and AER feeder categories are satisfactory;
- The processes for calculating reliability of supply measures are in compliance with established and up to date SA Power Networks Procedures;
- SA Power Networks has adequate processes and information to provide the Supply Restoration and Reliability Standards information to satisfy the requirements of Section 1.1 .3.1 "Service Standards" of the Electricity Distribution Code Issue 10;
- The Reliability of Supply calculations and data by SA Power Networks for the AER Service Target Performance Incentive Scheme for 2013/2014 and RINs 1a, 5b, 5d, 5.2.2, 6.2, 6.3, 6.4 and 7 are correct as included in Regulatory Information Notices (RIN) attached in Appendix B and as included in the STPIS (SPS) performance 2013-14 FINAL for Jacobs Review (Confidential) spreadsheet attached in Appendix F;
- The Reliability of Supply calculations by SA Power Networks for the ESCOSA Reliability Service Standards (SAIDI and SAIFI) for 2013/2014 are correct as included in the Proformas OP 2.1 and OP 2.3 attached in Appendix D;
- The calculation of the Major Event Day (MED) exclusion threshold for 2013/2014 is correct.

Appendix A. List of Procedures

Name	Authorised	Issue Date	Review Period (Mth)
Proc 570 - OMS Data Maintenance.doc	G. Coultas	1/4/2014	36
Proc 605 - Monthly Reliability Performance Reporting.doc	J. Ali	1/2/2013	36
Proc 608 - Calculating the Annual SPS Performance.doc	J. Ali	1/3/2013	12
Proc 609 - Feeder Mapping Process_DRAFT.doc	J. Ali	1/7/2014	Not specified[5]
Proc 613 – Draft Compliance with the AER's RIN	J. Ali	1/7/2014	Not specified
Proc 614 – Draft MED Threshold Calculation for the SPS.doc	J. Ali	1/7/2014	Not specified
Proc NOC-020.pdf	M. Napolitano	3/2013	36
Proc 607 – Compliance with ESCOSA's Electricity Industry Guideline No1	J Ali	1/4/2011	36

[5] Jacobs recommend that review periods are set for all procedures.

Appendix B. AER STPIS Reporting Templates 2013/2014 - SA Power Networks

1a STPIS Reliability

This information is collected to inform the application of the STPIS to the DNSP in future regulatory periods. The information is also collected to monitor network performance, and may be used in performance reports.

Table 1: SAIDI

Unplanned SAIDI	CBD	Urban	Rural short	Rural long	Whole network
Total	9	268.9	264.8	410.1	289.7
Total - after removing excluded events	9	128.7	197.0	314.1	167.6

Table 2: SAIFI

Unplanned SAIFI	CBD	Urban	Rural short	Rural long	Whole network
Total	0.115	1.810	1.915	2.819	1.979
Total - after removing excluded events	0.115	1.304	1.596	1.973	1.446

Table 3: Average distribution customer numbers

	CBD	Urban	Rural short	Rural long	Whole network
Customer numbers start of period	5,134	590,369	116,570	138,689	850,762
Customer numbers end of period	5,121	590,150	118,911	138,589	852,771
Average distribution customer numbers	5,128	590,260	117,741	138,639	851,767

5b Network Data – Feeder Reliability

This file is too large to Display. Refer to file: "SA Power Networks - ANNUAL RIN - 2013-14_DRAFT (Confidential)"

Note Energy data excluded from audit.

5d Outcomes Planned Outages

Table 1: Planned outages

	Network categorisation				
Planned outages	**CBD**	**Urban**	**Rural short**	**Rural long**	**Whole network**
SAIDI - after removing excluded events	34.0	72.4	62.3	89.9	73.6
SAIFI - after removing excluded events	0.173	0.405	0.514	0.809	0.485

5.2.2 Distribution customer numbers by location on the network

5. Operational data worksheet

Regulatory year		2014 (i.e. 2013/14)

5.2 Customer numbers

Table 5.2.2 Distribution customer numbers by location on the network

Customers on CBD network	number	5,128
Customers on Urban network	number	590,260
Customers on Short rural network	number	117,741
Customers on Long rural network	number	138,639
Total customer numbers	number	851,767

6.2 Reliability and Customer Services performance

Table 6.2.1 - Unplanned minutes off supply (SAIDI) - Actual, target and proposed reliability

		Actual					Estimate	Proposed target				
Unplanned minutes off supply (SAIDI)		2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20
Total sustained minutes off supply	CBD	8.9	18.8	11.7	12.6	9.0	28.2					
	Urban	132.6	218.2	105.7	139.7	268.9	130.1					
	Short rural	302.8	352.0	310.0	288.6	264.8	225.2					
	Long rural	424.2	705.0	332.6	585.4	410.1	362.2					
	Total	207.0	317.7	171.1	232.8	289.7	182.4					
Total value of excluded events* *see 3.3 of STPIS	CBD	0.0	5.2	0.0	0.0	0.0	1.1					
	Urban	12.8	103.8	12.6	30.1	140.2	25.7					
	Short rural	23.3	155.0	114.5	88.7	67.8	41.2					
	Long rural	108.4	431.0	98.3	344.0	96.0	92.0					
	Total	31.1	165.9	41.0	89.4	122.1	39.2					
Total sustained minutes off supply after removing excluded events	CBD	8.9	13.6	11.7	12.6	9.0	27.1					
	Urban	119.8	114.4	93.1	109.6	128.7	104.4					
	Short rural	279.5	197.0	195.6	199.9	197.0	184.0					
	Long rural	315.7	274.0	234.2	241.4	314.1	270.2					
	Total	176.0	151.8	130.1	143.3	167.6	143.2					

Table 6.2.2 - Unplanned interruptions to supply (SAIFI) - Actual, target and proposed reliability

		Actual					Estimate	Proposed target				
Unplanned interruptions to supply (SAIFI)		2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20
Total sustained customer interruptions	CBD	0.079	0.136	0.141	0.158	0.115	0.268					
	Urban	1.488	1.862	1.217	1.494	1.810	1.544					
	Short rural	2.321	2.400	2.220	2.047	1.915	1.995					
	Long rural	2.728	3.479	2.141	2.946	2.819	2.582					
	Total	1.815	2.198	1.504	1.801	1.979	1.776					
Total value of excluded events* *see 3.3 of STPIS	CBD	0.000	0.035	0.000	0.000	0.000	0.005					
	Urban	0.148	0.556	0.082	0.261	0.507	0.252					
	Short rural	0.134	0.579	0.424	0.403	0.319	0.259					
	Long rural	0.489	1.626	0.488	1.462	0.846	0.471					
	Total	0.205	0.739	0.196	0.475	0.533	0.289					
Total sustained customer interruptions after removing excluded events	CBD	0.078	0.101	0.141	0.158	0.115	0.263					
	Urban	1.341	1.305	1.135	1.232	1.304	1.292					
	Short rural	2.186	1.821	1.796	1.645	1.596	1.736					
	Long rural	2.240	1.853	1.653	1.484	1.973	2.111					
	Total	1.610	1.459	1.308	1.326	1.446	1.487					

6.3 Sustained Interruptions

This file is too large to Display. Refer to file: “SA Power Networks Category Analysis RIN 2013-14_DRAFT (Confidential)”

6.4 Historical Major Event Days

This file is too large to Display. Refer to file: “SA Power Networks draft Reset RIN_DRAFT (Confidential)_rev1”

7 Quality of service worksheet

Regulatory year		2014
Variable	**Unit**	
Table 7.1 Reliability		
Table 7.1.1 Inclusive of MEDs		
Whole of network unplanned SAIDI	minutes/customer	289.7
Whole of network unplanned SAIDI excluding excluded outages	minutes/customer	287.0
Whole of network unplanned SAIFI	interruptions/customer	1.979
Whole of network unplanned SAIFI excluding excluded outages	interruptions/customer	1.828
Table 7.1.2 Exclusive of MEDs		
Whole of network unplanned SAIDI	minutes/customer	170.3
Whole of network unplanned SAIDI excluding excluded outages	minutes/customer	167.6
Whole of network unplanned SAIFI	interruptions/customer	1.597
Whole of network unplanned SAIFI excluding excluded outages	interruptions/customer	1.446
Table 7.2 Energy not supplied		
Energy Not Supplied (planned)	GWh	1.494
Energy Not Supplied (unplanned)	GWh	5.827
Energy Not Supplied - Total	GWh	7.321

Appendix C. MED Calculations 2005/2013

MED Daily Threshold for 2013/2014 is 5.628 minutes.

SAIDI Threshold using Box-Cox methodolgy

	05_09	05_10	06_11	07_12	08_13
Years	4	5	5	5	5
Average	-1.43272	-1.41777	-1.45818	-1.52052	-1.51670
Median	-1.38832	-1.36971	-1.39379	-1.46482	-1.45452
Standard Deviation	1.19483	1.20949	1.27540	1.27870	1.30993
2.5					
$\alpha + 2.5*\beta$	1.55436	1.60595	1.73032	1.67624	1.75812
Lambda (λ)	0.07079	0.06967	0.04649	0.03576	0.02015
Daily SAIDI Threshold	**4.369**	**4.583**	**5.282**	**5.093**	**5.628**

Appendix D. OP 2.1 (SAIDI) and OP 2.3 (SAIFI)

Proforma OP 2.1 – System Average Interruption Duration Index (SAIDI — Quarterly)[6]

SAIDI Region	Month												Year to Date
	Jul	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	
Adelaide Business Area	0.0	1.3	0.2	2.8	0.2	0.3	1.5	1.1	0.2	0.2	1.1	0.0	9.0
Major Metropolitan Areas	14.6	9.8	15.1	13.7	10.6	34.8	17.9	107.4	10.0	8.6	7.8	14.7	265.0
Barossa/Mid-North & Yorke Peninsula/Riverland/Murraylands	8.9	13.3	53.1	29.7	4.6	17.3	48.7	26.2	11.1	3.9	7.4	18.1	242.2
Eastern Hills/Fleurieu Peninsula	83.9	60.5	66.0	22.5	15.2	26.9	32.5	34.6	20.9	14.9	22.0	25.4	425.1
Upper North & Eyre Peninsula	35.0	38.3	12.5	18.0	12.5	93.3	40.1	46.3	16.1	20.5	15.7	41.9	390.1
South East	92.9	73.4	48.5	19.3	18.2	19.1	37.3	27.7	36.0	3.1	22.5	29.5	427.5
Kangaroo Island	32.2	99.2	98.6	9.4	2.4	36.4	35.3	10.9	4.3	2.2	42.0	12.1	384.9
Total	23.7	18.6	25.5	16.7	10.6	34.0	24.6	84.5	12.2	8.8	10.0	17.7	287.0

[6] These data refer only to unplanned outages in accordance with clause 1.1.3 of the **Electricity Distribution Code**.

Proforma OP 2.3 – System Average Interruption Frequency Index (SAIFI - Quarterly)[7]

SAIFI Region	Month												Year to Date
	Jul	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	
Adelaide Business Area	0.000	0.023	0.000	0.020	0.006	0.004	0.034	0.008	0.002	0.003	0.015	0.000	0.115
Major Metropolitan Areas	0.141	0.098	0.159	0.143	0.098	0.165	0.203	0.325	0.106	0.081	0.085	0.116	1.719
Barossa/Mid-North & Yorke Peninsula/Riverland/Murraylands	0.116	0.088	0.282	0.221	0.033	0.148	0.214	0.206	0.073	0.025	0.051	0.136	1.593
Eastern Hills/Fleurieu Peninsula	0.400	0.451	0.488	0.197	0.129	0.163	0.187	0.244	0.162	0.099	0.213	0.169	2.901
Upper North & Eyre Peninsula	0.188	0.181	0.183	0.073	0.070	0.271	0.190	0.170	0.047	0.055	0.103	0.162	1.691
South East	0.455	0.243	0.241	0.113	0.119	0.176	0.263	0.225	0.257	0.024	0.212	0.117	2.445
Kangaroo Island	0.277	1.202	0.415	0.043	0.018	0.093	0.291	0.070	0.035	0.011	0.174	0.222	2.851
Total	0.174	0.142	0.207	0.151	0.092	0.167	0.204	0.289	0.108	0.072	0.098	0.125	1.828

[7] These data refer only to unplanned outages in accordance with clause 1.1.3 of the **Electricity Distribution Code**.

Appendix E. Audit Compliance Certificate 2013/2014

Appendix F. STPIS (SPS) performance 2013-14 FINAL for Jacobs Review (Confidential)

Unplanned SAIDI	YTD	YTD SPS Impact	Annual Target	Variation
CBD	9.00	$620,953	$1,869,900	$1,248,947
URBAN	128.70	$49,517,093	$40,167,900	-$9,349,193
RURAL SHORT	196.98	$13,887,329	$12,972,000	-$915,329
RURAL LONG	314.11	$27,091,868	$23,304,750	-$3,787,118
STATE	167.60	$91,117,243	$78,314,550	-$12,802,693

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Excl. Abnormals and excl. MEDs

Unplanned SAIFI	YTD	YTD SPS Impact	Annual Target	Variation
CBD	0.1155	$728,238	$1,658,873	$930,635
URBAN	1.3038	$41,755,027	$41,377,269	-$377,758
RURAL SHORT	1.5958	$12,922,622	$14,057,694	$1,135,072
RURAL LONG	1.9730	$23,664,530	$25,319,334	$1,654,804
STATE	1.4459	$79,070,417	$82,413,170	$3,342,752

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Excl. Abnormals and excl. MEDs

Feeder Category	Total SPS Impact YTD	Annual Target	Variation
CBD	$1,349,191	$3,528,773	$2,179,582
URBAN	$91,272,120	$81,545,169	-$9,726,951
RURAL SHORT	$26,809,951	$27,029,694	$219,743
RURAL LONG	$50,756,399	$48,624,084	-$2,132,315
STATE	**$170,187,660**	**$160,727,720**	**-$9,459,941**

SPS State-wide Result	-$9,459,941	-1.26%

Feeder Category	SAIDI Targets (mins.)	SAIDI Incentive Rate / min.	Annual Target
State (equiv.)	143.2	$610,500	$78,314,550
CBD	27.1	$69,000	$1,869,900
Urban	104.4	$384,750	$40,167,900
Rural Short	184.0	$70,500	$12,972,000
Rural Long	270.2	$86,250	$23,304,750

Feeder Category	SAIFI Targets	SAIFI Incentive Rate / 0.01 interruption	Annual Target
State (equiv.)	1.487	$584,250	$82,413,170
CBD	0.263	$63,075	$1,658,873
Urban	1.292	$320,258	$41,377,269
Rural Short	1.736	$80,978	$14,057,694
Rural Long	2.111	$119,940	$25,319,334
		Total SPS Target	$160,727,720

Incentive (%)	CBD	Urban	Rural Short	Rural Long
SAIDI (per min)	0.0092%	0.0513%	0.0094%	0.0115%
SAIFI (per Int)	0.8410%	4.2701%	1.0797%	1.5992%

Annual Forecast Revenue 2015/16	$750,000,000

Annual SPS Cap	$22,500,000