



ABN 20 009 454 111

Audit Report
Rottnest Island
2017 Network Quality and Reliability of Supply
Performance Audit -
Operation of Compliance Monitoring Systems



executive summary

Under the Electricity Industry (Network Quality and Reliability of Supply) Code 2005 (the Code), Division 3, Section 26, Rottneest Island Authority (RIA) is required to arrange for an independent audit of the operation of the systems that are in place to monitor its compliance with Part 2 of the Code or an instrument made under Section 14(3). In July 2017 the RIA commissioned Qualeng to carry out the audit in respect of the operation of the systems to cover the period 1 July 2016 to 30 June 2017.

The RIA's distribution system consists of an 11 kV distribution network (defined as the 11 kV HV Transmission System), both underground and above ground, a number of substations and a 415V LV distribution network comprising five underground feeders. The RIA has contracted Programmed Facility Management (PFM) to manage, operate and maintain the electricity assets and to be responsible for compliance with the licence conditions and with the Code.

The audit was conducted between August and September 2017 and included:

- review of the actions resulting from previous audit recommendations;
- review of supporting documentation;
- interviews of key personnel;
- review of evidence, data, reports and processes demonstrating the operation and performance of the systems.

The audit reviewed one opportunity for improvement reported in the previous audit and found that actions had been taken to address the issue.

The audit found that the RIA and PFM have maintained adequate systems to monitor compliance with the requirements of Part 2 of the Code. There are processes in place for:

- monitoring the compliance of electricity supply quality through measurement of voltage fluctuations (flicker) and voltage harmonic distortion, this takes place through

independent testing and review of network performance;

- systems are in place to record and document recommendations and actions arising from the electricity supply quality monitoring;
- monitoring of compliance with the requirement to ensure that the supply of electricity to a customer is maintained and the occurrence and duration of interruptions is kept to a minimum through recording, reporting of outage data and calculation of performance;
- monitoring of interruption duration, frequency and causes of interruption by means of registers for planned and forced outages;
- managing planned and forced interruptions through documented procedures;
- documenting outage procedures, disaster recovery plans, restoration priority and emergency response to maintain the electricity supply and reduce the effect of interruptions on customers;
- monitoring the customer notification process for planned outages, supplementing it with phone communication and text messaging;
- monitoring of compliance with the requirement to remedy the causes of significant interruptions or provide alternative arrangements; monitoring is achieved through the calculation and reporting of reliability data, recording of issues and recommended actions in tracking registers and documenting improvement proposals in Capital Expenditure Plans .

No non-compliances were recorded in this audit.

RIA identified breaches of the Code standards for electricity supply quality and reliability, however, in these instances the Code require compliance "so far as is reasonably practicable" and there was sufficient evidence to show that, in accordance with subparagraphs 5(1), 11(1)(b)(ii) and 13(2), it was not reasonably practicable to comply with the prescribed standards.

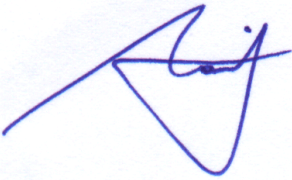
The RIA is assessing the causes of the breaches and corrective actions are in progress. In particular:

- long term voltage fluctuations at the Abbott Street and Geordie Bay locations were in excess of the standards set in the Code, these results were subject to investigations and to improvement actions which are in progress;
- significant planned and forced outages occurred during the audit period which caused breaches with the reliability and notification requirements in Division 2 and 3 of the Code. These incidents were investigated and recommendations have been documented.

Based on the scope of the audit defined in section 26 of the Code Qualeng has found that Rottneest Island Authority has in place systems to monitor its compliance with the requirements of Part 2 of the Code, Quality and Reliability Standards.

This report is an accurate representation of the findings and opinions of the auditors following the assessment of the client's conformance to nominated Licence conditions. The report is reliant on evidence provided by other parties and is subject to limitations due to the nature of the evidence available to the auditor, the sampling process inherent in the audit process, the limitations of internal controls and the need to use judgement in the assessment of evidence. On this basis Qualeng shall not be liable for loss or damage to other parties due to their reliance on the information contained in this report or in its supporting documentation.

Approvals

Representation	Name	Signature	Position	Date
Auditor:	M Zammit		Lead Auditor	19/09/2017

Ref		Issue Status		
Issue No	Date	Description	Approved	
A	14/09/2017	First Draft issue	MZ	
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1 Objectives and Scope of Audit

1.1 INTRODUCTION

Rottneest Island Authority (RIA) has an Electricity Integrated Regional Licence (EIRL3) (the Licence) issued by the Economic Regulation Authority (the Authority) under Sections 7 and 15(2) of the Electricity Industry Act 2004 (WA) (the Act). Under the scope of the Licence RIA generates and distributes electricity to commercial customers.

Under the terms of the Act RIA is required to comply with the Electricity Industry (Network Quality and Reliability of Supply) Code 2005 (the Code). In accordance with Division 3 "Performance reporting", Section 26 "Annual report on monitoring systems" of the Code, RIA is required to arrange for an independent audit of the operation of the systems that are in place to monitor its compliance with Part 2 of the Code or an instrument under Section 14(3).

In July 2017 RIA commissioned Qualeng to carry out the Performance Audit to cover the period 1 July 2016 to 30 June 2017. The audit has been conducted and this report prepared in accordance with the Code.

The RIA's distribution system consist of an 11 kV network (identified as the 11 kV HV Transmission System) comprising two feeders (number 2 and number 6), both underground and above ground, supplying the outlying areas, a number of substations and a 415V LV distribution network comprising five feeders (Feeders 1, 3, 4, 5 and 7) which supplies customers in the settlement area.

The RIA has placed the responsibility for managing the operation and maintenance of the licence assets on Programmed Facility Management (PFM) under a contractual agreement, the Facilities Utilities and Support Services (FUSS) agreement. Under the FUSS PFM is responsible for compliance with the licence conditions and with the Code.

1.2 AUDIT OBJECTIVES

The purpose of the Performance Audit is to assess and report on the operation of the systems implemented by the licensee to monitor its compliance with Part 2 of the Code or an instrument under section 14(3).

1.3 AUDIT SCOPE

Part 2 of the Code includes 4 Divisions:

1. Division 1, "Quality Standards" for compliance with requirements for quality of supply at the point of connection to the customer, in regard to voltage fluctuations and harmonic distortion.
2. Division 2, "Standards for the interruption of supply to individual customers" provides for the maintenance of supply and management of interruptions to customers, both in terms of the duration and number of interruptions. It includes for:
 - 2.1. Provision of supply with the minimum number and duration of interruptions.
 - 2.2. Consideration of providing alternative supply if the interruption is expected to be significant, its effect substantial on a business or if the customer has special health needs that require continuous supply.
 - 2.3. Allowing planned interruptions if the customer is notified within a suitable time and where the duration does not exceed 6 hours, or 4 hours for temperatures over 30 C or north of the 26th parallel.
 - 2.4. Provides for the distributor to remedy the causes of interruptions or enter into alternative arrangements if the supply has been interrupted more than 12 hours continuously or more than 16 times in the prescribed 12 months and it is considered that the prescribed standard is unlikely to be met for the customer.
3. Division 3, "Standards for the duration of interruptions of supply in particular areas" provides that the average length of interruptions should not exceed 290 minutes in any area of the State, other than the Perth CBD and urban areas and 160 minutes for urban areas other than the Perth CBD (calculated as the average of the yearly averages over 4 years).
4. Division 4, "Variations of obligations under this Part" provides for:
 - 4.1. review and approval by the Minister of alternative requirements and
 - 4.2. agreement between the transmitter/distributor and the customer of extensions and modifications to the standards.

The audit was carried out between August and September 2017.

The following representatives participated in the audit on RIA's behalf and/or contributed to sourcing the documentation and providing evidence to the audit:

- Mr Orrin Neale, Island Engineer, PFM.

The main auditor representative was Mr Mike Zammit, Lead Auditor.

1.4 AUDIT METHODOLOGY

The audit followed in part the methodology defined in the Authority's Audit and Review Guidelines: "Electricity and Gas Licences", April 2014, including:

- preparation of an audit plan and risk assessment for Qualeng internal control,

- fieldwork,
- reporting.

The audit proceeded through a documentation review, meetings, interviews and checks of processes. These were supported by additional queries to clarify aspects of policies and procedures.

1.5 LIMITATIONS AND QUALIFICATIONS

An audit provides a reasonable level of assurance on the effectiveness of control procedures, however there are limitations due to the nature of the evidence available to the auditor, the sampling process inherent in checking the evidence, the limitations of internal controls and the need to use judgement in the assessment of evidence.

1.6 ACRONYMS AND ABBREVIATIONS

Abbreviation	Description
Authority	Economic Regulation Authority
CAIDI	Customer Average Interruption Duration Index
CMMS	Computerised Maintenance Management System
Code	Electricity Industry (Network Quality and Reliability of Supply) Code 2005
FUSS	Facilities Utilities and Support Services
HV	High Voltage
LV	Low Voltage
NA	Not Applicable
PFM	Programmed Facility Management
Plt	Long Term Flicker (as defined in the Code)
Pst	Short Term Flicker (as defined in the Code)
QoS	Quality of Supply (as defined in the Code)
RIA	Rottneest Island Authority
RMU	Ring Main Unit
SAIDI	System Average Interruption Duration Index
SAIFI	System Average Frequency Duration Index



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ROTTNEST ISLAND 2017 NETWORK QUALITY AND RELIABILITY OF SUPPLY PERFORMANCE AUDIT - OPERATION OF COMPLIANCE MONITORING SYSTEMS Ref 48/12

Abbreviation	Description
THD	Total Harmonic Distortion

2 Licensee's Response to Previous Audit Recommendations

2.1 BACKGROUND

The previous quality and reliability of supply audit was completed in September 2016. This section reviews RIA's progress on the recommendations of the 2016 audit as well as RIA's planned actions to address any outstanding issues.

The recommendations arising from the previous report and the status of the actions determined in this audit have been summarised in the following table.

2.2 PROGRESS OF ACTIONS FROM 2016 AUDIT

The following table lists the recommendations made in the 2016 audit and records progress of any actions.

Item No	Code Ref	Requirement	Findings	2016 Recommendations and Opportunities for Improvement	Status
1	Part 2 Div 1, Sec. 5-7	<p>Quality and Reliability standards, voltage fluctuations, harmonics:</p> <p>A transmitter and a distributor must, so far as is reasonably practicable, ensure that electricity supplied by the transmitter or distributor to a customer's electrical installations, as measured at the point of connection of those installations to the network, at all times complies with the standards including voltage fluctuation (flicker) and harmonics.</p>	<p>▶ The procedure "Independent Power Quality Monitoring and Evaluation" does not note that the "Electricity Action Tracker" is used to document the actions resulting from the testing of electricity supply.</p>	<p>1/2016. The procedure "Independent Power Quality Monitoring and Evaluation" should note that actions arising from the testing of electricity supply quality should be documented in the "Electricity Action Tracker"</p>	<ul style="list-style-type: none"> Recommended information was added to the "PRO-RNI-I02-001 Independent Power Quality Monitoring and Evaluation Procedure" The "Electricity Action Tracker" has been in use through the audit period. <p>Action: CLOSED</p>

3 Key Findings

3.1 SYSTEM TO MANAGE COMPLIANCE WITH PART 2, DIVISION 1, QUALITY STANDARDS (SEC. 5 TO 8)

Requirement: The Licensee is required to have systems in place to monitor compliance with requirements for quality of supply at the point of connection to the customer, both in terms of voltage fluctuations and harmonic distortion and for disconnection of customer where there is a possibility of damage to the customer installation.

3.1.1 Quality of Supply: System/Process (sections 5 - 7)

Through discussion with the Island Engineer and review of documentation the audit found that there are systems in place for monitoring compliance with the Code quality standards including:

- independent testing is planned annually and managed through the Programmed Facility Management (PFM) work management system and the procedure “PRO-RNI-I02-001 Independent Power Quality Monitoring and Evaluation Procedure”;
- the CMMS database (Maximo) stores the Preventative Maintenance schedule which includes the task for testing the electricity supply, a Work Order is generated to initiate the task;
- testing was carried out in March 2017 and the report “Rottnest Island Power Quality Report March 2017 – Revision 01” was prepared by an independent testing consultant;
- the report was subject to PFM’s review which was documented in the “Power Quality Monitoring Review 2016-2017”, the review incorporated recommendations;
- recommendations have resulted in the inclusion of projects in the proposed capital expenditure program for 2017-18 for the replacement of aging transformers in applicable locations.

The testing was carried out at 6 locations in March 2017:

- Abbott St Substation, off Feeder 2
- Feeders 1, 3, 4 and 5;
- Geordie Bay Substation.

Measurements were included in the report and showed, in regard to voltage fluctuations (or flicker):

- all measurements of short term voltage fluctuation (P_{ST}) were in compliance with compatibility limits except for single transient one-off spikes;
- there were no continuous instances of short term voltage fluctuation in excess of the compatibility limit.

In regard to long term voltage fluctuation:

- ▶ long term voltage fluctuations (PLT) were also in compliance with the Code compatibility limits except for two sites which showed several significant peaks over the compatibility limit:
 - Abbott Street and
 - Geordie Bay.

An action has been undertaken to address this occurrence of long term flicker:

- transformers at the Abbott Street and Geordie Bay locations were originally installed in 1979 and had a 40 years life expectancy; funding for the replacement of the transformers has been included in the “CAPEX Proposal 2017/18”.

In regard to harmonic distortion,

- measurements of harmonics were in compliance with the Code standards for Total Harmonic Distortion (THD).

Table 1: Flicker and Harmonics Measurements

Site	Flicker (Pst < 1.0; Plt < 0.8)		Harmonics (THD < 8%)	Customer's Complaints on Quality	Remedial Actions
	Pst	Plt	(Max %)		
Feeder 1 Feeder 3, Shopping Precinct Feeder 4, Tea Rooms Feeder 5, Lodge	Single spikes e.g.: <ul style="list-style-type: none"> • Feeder 1, 11/3, 2 AM • Feeder 3, 8/3 6:15 AM etc) 	Complying	Complying	Nil	Nil

Site	Flicker (Pst < 1.0; Plt < 0.8)		Harmonics (THD < 8%)	Customer's Complaints on Quality	Remedial Actions
	Pst	Plt	(Max %)		
Abbott St Substation	1.42 max one-off spike on 10/3, 2AM • 3 spikes marginally over limit: 14/3, 2 PM 15/3, 2 AM 15/3, 4 AM	• 4 Peaks above limit. • 1 spike on 14/3 coincides with generating plant trip.	Complying	Nil	Funding for the replacement of transformers has been included in CAPEX Proposal
Geordie Bay	1.33 max one-off spike • 4 other spikes at different times marginally above limit	• 4 spikes at different times, 0.95 peak • 1 spike on 14/3 coincides with generating plant trip.	Complying	Nil	Funding for the replacement of transformers has been included in CAPEX Proposal

3.1.2 Duty to Disconnect if Quality of Supply may Lead to Damage (section 8)

Procedures are in place providing guidance on the disconnection of customers where the customer installation may suffer damage due to electricity supply quality:

- the “PRO-RNI-I02-001-1 Independent Power Quality Monitoring and Evaluation Procedure” includes the direction to disconnect customers where the customer installation may suffer damage due to electricity supply quality.

Disconnection can also be reactive in response to customer complaints or operational feedback:

- the form “Utility (Electricity, Water, Gas) Customer Complaint Form” is available for customers to register their complaints;
- the “Utilities Customer Complaints Procedure” is published by the Rottnest Island Authority (RIA) on the RIA web site for customers’ use;
- power may be disconnected in response to complaints, inspections findings or observations of power fluctuations.

During the audit period there was one customer complaint related to power, however it was not in regard to power quality.

3.1.3 Summary of electricity supply quality issues and reports

Voltage fluctuations and harmonic voltage distortion levels were monitored during the audit period. A system of review of findings was in place and recommendations made for readings that were in excess of the Code compatibility levels.

It was noted that long term flicker (P_{LT}) was in excess of Code requirements at two customer locations, one action was identified and is in progress.

3.2 SYSTEM TO MANAGE COMPLIANCE WITH PART 2, DIVISION 2, STANDARDS FOR INTERRUPTION OF SUPPLY (SEC. 9-12)

The licensee must establish systems to monitor compliance with requirements to minimise interruptions to customers, both in term of the duration and number of interruptions. The requirements are for the licensee to:

- Maintain the supply with the minimum number and duration of interruptions (Sec. 9);
- Reduce the effects of interruptions; consider providing alternative supply if the proposed interruption is expected to be significant, its effect substantial on a business or if the customer has special health needs that require continuous supply (Sec. 10);
- Ensure that where interruptions are planned, where practicable the customer is notified within a suitable time and the duration does not exceed 6 hours, or 4 hours for temperatures over 30 C or north of the 26th parallel (Sec. 11);
- Remedy the causes of interruptions or enter into alternative arrangements if the supply has been interrupted more than 12 hours continuously or more than 16 times in the prescribed 12 months and it is considered that the prescribed standard is unlikely to be met for the customer (Sec. 12).

3.2.1 Duty to maintain the supply with a minimum number and duration of interruptions (Sec. 9)

Requirement: The licensee must establish systems to monitor compliance with the requirement to ensure, so far as is reasonably practicable, that the supply of electricity to a customer is maintained and the occurrence and duration of any interruptions is kept to a minimum.

The operator has in place a system to monitor compliance with the requirement that the supply of electricity to a customer is maintained and the occurrence and duration of any interruptions is kept to a minimum. The system includes:

- three registers which record outage information such as outage identification, dates, both interruption and restoration times, duration, causes and notification of planned interruptions:
 - the “Operational Outages” register, which records forced interruptions;
 - the “Planned Outages” register, which records scheduled interruptions required for maintenance, testing and improvements;
 - the “Notification” list which records the information about all planned outage notifications;
 - all data in the above registers is colour coded so that outages with excessive duration are highlighted;
- a summary report which calculate the SAIDI, SAIFI and CAIDI performance, (i.e. in brief these are respectively: the average total duration of outages for each customer served, the number of

interruptions that a customer experiences and the average length of each interruption per customer) over the period;

- procedures guiding the management and outage data collection, these include:
 - the “PRO-RNI-I03-035-1 Powerhouse Outages Procedure” which assist in the identification of outage causes and the handling of outages;
 - “PRO-RNI-I03-039-1 System Performance Measures SAIDI SAIFI CAIDI Procedure” for the calculation of reliability figures;
- a register, the “Electrical Customer Complaints Reporting Register (RIA)” which records customer complaints regarding the electricity supply;
- all outages have been reviewed, all Operational outages are covered by incident reports, usually done after the event, in some cases they have been investigated and the causes analysed;
- details of rectification work are basic and are stored in Maximo;
- an “Electricity Action Tracker” list which records the issues affecting the electricity supply and the actions proposed and taken to rectify non compliances and faults.

In addition the following procedures are in place to minimise the duration and impact of interruptions:

- Disaster recovery plans,
 - “Electrical Disaster Recovery Plan” includes critical fail scenarios;
 - “Disaster Recovery Plan for Electrical Distribution System” gives a detailed map of where to connect mobile generator sets and a step by step procedure for restoring supply;
- Testing of recovery plans which is recorded on “Electricity Business Continuity Drill Form”:
 - records were examined for a test carried out on 5/9/16. this was an ‘after the fact’ test and a drill on how to respond to a generator shutting down due to lack of fuel.

In the 2016 - 2017 reporting period there were 10 Planned and 18 Operational (forced) outages.

Improvement Actions

In order to minimise the impact of interruptions and maintain supply the following actions have been taken in the audit period:

- additional mobile generators have been purchased:
 - the purchase of 2x 250 kVA mobile generator sets was approved by the Board, these have been added to the one already on the island (Golf course 130 kVA);
- the purchase of five stand-by back-up generators and the overhaul of the mobile generator at the Golf Course have been recommended so as to provide temporary supplies to critical customers and infrastructure in the event of power failures;

- from the end of January 2017 the generation mix has been further diversified with the commissioning of the new 600kW solar farm.

Summary:

Table 2: Systems to monitor compliance with requirement to maintain supply and the occurrence and duration of interruptions to a minimum

Site	Procedures dealing with outages	Systems and Procedures monitoring performance
All	Yes	Yes

3.2.2 Duty to reduce the effects of interruptions and provision of alternative supplies for proposed interruptions (Sec. 10)

Requirement: The licensee must establish systems to monitor compliance with its duty to reduce, so far as is reasonably practicable, the effect of any interruptions and consider providing alternative supply for proposed interruptions:

- if the proposed interruption is greater than 6 hours, or
- there is a substantial effect on the business or
- there are special health needs customers.

Reduce the effect of any interruptions

Discussion with the Operations Engineer and review of documentation showed that there are procedures in place to monitor and reduce the effect of any interruptions:

- through the “Operational Outages” register which records forced interruptions, the “Planned Outages” register which records scheduled interruptions and monthly reviews, the extent and duration of interruptions is monitored;
- customer interruption performance is monitored in the “Reliability Measures Spreadsheet” which calculates the SAIDI, SAIFI and CAIDI figures for the network;
- there is review of performance at monthly meetings.
- the “Master Utilities Action Tracker” reports on issues which have been identified following incidents and interruptions and any recommendations raised in order to mitigate future occurrences;
- the “PRO-RNI-I03-041-1 Restoration Priority Register Electrical Services Procedure”, provides for prioritisation of electricity supply restoration to reduce the impact of interruption on critical customers.

Provision of Alternative Supply

There are documented plans for the use of alternative supplies in the event of significant interruptions, these include:

- the “PRO-RNI-I03-041-1 Restoration Priority Register Electrical Services Procedure” which provides the restoration priority to the island seven distribution feeders in case of a power failure;
- the “Generator Restoration Priority Register (LV Board Failure) Electrical Services Procedure” is in place to address a catastrophic electricity supply failure to the LV system preventing restoration of power through the LV distribution feeders. In this case power will be supplied by mobile generators in accordance with this register;
- the “Electrical Services Disaster Recovery Plan” provides the step by step responses to eight possible electricity supply fail scenarios at Rottnest Island;
- the “Electrical Disaster Recovery Plan for the Electrical Distribution Network” provides all the information necessary for the isolation of distribution feeders and the connection of mobile generator sets to teach feeder where no supply can be provided through the LV Distribution feeders.

Special Health Needs Customers and Commercially Sensitive Loads

There were no special health needs (SHN) customers on the island during the audit period.

Customers with special health needs have to apply for special support to the RIA, the process is informal and there have been no instances of applications in the last few years. The island has no facilities or resources for supporting SHN customers.

Commercially sensitive loads are identified in various procedure and a process is in place for the advanced notification of planned outages to business customers and for the management of their interruptions. The following procedures are in place:

- the procedure, “PRO-RNI-I03-034-1 Planned Outage Notification Procedure” requires that 72 hours advance notification be provided to customers and identifies customers in need of alternative power generation;
- some of the customers on the island, such as Telstra, have their own back up generator sets, however others, like the nursing post and the police rely on PFM for back up supplies.

Improvement Actions to reduce the Effect of Interruptions and Providing Alternative Supplies

In order to minimise the impact of interruptions and maintain supply the following actions have been taken in the audit period:

- additional mobile back-up generators have been purchased to provide temporary supply and reduce the effects of interruptions;

- energy from solar farm has started to supply the network from the end of January 2017, there were initial teething problems however in the long run the additional source of electricity will increase the flexibility of the network.

In addition the following projects have been identified and included in future CAPEX to strengthen the network:

- transformers supplying Abbott St and Geordie Bay locations were originally installed in 1979 and had a 40 years life expectancy; a proposal for the replacement of the transformers has been included in the “List of Priority Capital Works 2017/18 - FUSS Contract”.

Summary

Table 3: Systems to monitor compliance with duty to reduce the effect of interruptions and provide alternative supply for planned interruptions

Site	Reduce the Effect of Interruptions	Alternative Supply	Special Needs Customers
All	Yes	Yes	NA (There were no special health needs customers on Rottnest Island in the audit period)

3.2.3 Planned interruptions and Notifications (Sec. 11)

Requirement: The licensee must establish systems to monitor compliance with the requirement to maintain planned interruptions, so far as is reasonably practicable, to a duration not exceeding 6 hours and providing notifications at least 72 hours before each outage for eligible persons (customers using no more than 50 MWh per year).

PFM has a system in place to manage and monitor planned outages and notifications.

Planned Outages Not Exceeding 6 Hours

As noted in section 3.2.1, PFM follows a number of procedures to monitor the compliance with the Code planned outage duration:

- it keeps a register of planned outages, the “Planned Outages Rottnest Island 2016-2017” register, which records the scheduled interruptions required for maintenance, testing, improvements and their duration, flagging those that are in excess of the requirement of Section 11 of the Code;
- the “PRO-RNI-I03-039-1 System Performance Measures SAIDI SAIFI CAIDI Procedure” provides the instructions for the entry of data into the “Planned Outages” spreadsheet for the calculation of

outage duration.

There were 10 planned interruptions during the audit period and all interruption durations were in compliance with the requirements of the Code.

Planned Outage Notifications

The system for monitoring the notification process includes:

- the “PRO-RNI-I03-034-1 Planned Outage Notification Procedure”, which sets up the requirements and process of notification;
- the “PRO-RNI-I03-039-1 System Performance Measures SAIDI SAIFI CAIDI Procedure” which controls the input and processing of data in the “NOTICES: Planned Outages Rottnest Island 2016-2017” spreadsheet for the calculation of the notification periods;
- the “Notification” spreadsheet which records the time of notification against the time of the outage and calculates the notification interval; intervals that are in excess of the prescribed 72 hours are flagged.

In addition to the routine notification customers are also advised of the outage through mobile phone text messaging and phone calls. The audit examined records of:

- e-mail notifications for planned outages;
- records of mobile phone text messaging (SMS);
 - the records of messages for outages of the 31 August showed that customers had been advised 108 hours prior to the outage;
 - records for an outage on the 30 June showed that following the routine notification several follow-up messages were sent to update the customers on the progress of the outage process.

Due to the RIA more onerous requirement of 108 hours advance notification most of the advice was sent to customers well in advance of the Code requirement.

The audit noted that:

- ▶ For three interruptions between February and March 2017 the customers did not receive the notification within the prescribed limit. The audit found that:
 - two of the outages of February 2017 were required for the replacement of the emergency generator; notifications were sent 26 and 34 hours respectively; this work led to the third outage in March 2017 which was required for the reinstatement of the 11 kV overhead distribution line; a notification was sent 68 hours ahead of the interruption.

In view of the criticality of the plant affected by the interruption the audit considers that the distributor has fulfilled the conditions of the Code that, under Clause 11(1)(b)(ii) permits the following:

11 (1)(b)(ii) if it is not reasonably practicable to comply with subparagraph (i), at the earliest practicable time before the start of the interruption.

Summary

Table 4: Systems to monitor compliance with planned outages not exceeding 4 or 6 hours and providing notifications at least 72 hours before each planned outage

Site	Systems to monitor duration of interruptions ($\leq 6h$)	Systems to monitor notifications ≥ 72 hours prior
All	Yes	Yes

3.2.4 Significant interruptions to small use customers (Sec.12)

Requirement: The transmitter / distributor must establish systems to monitor compliance with the requirement to remedy the causes of interruptions or make alternative arrangements where significant interruption (duration over 12 hours or more than 16 interruptions in the preceding year) occurred for small use customers and where the Licensee considers that the prescribed standard (9 years out of 10) is unlikely to be met.

Through discussion with the Island Engineer, review of documentation and records the audit found that there is a system to monitor interruptions which exceed 12 hours or affecting small use customers more than 16 times in a year. In addition a number of actions have been taken to remedy the causes or make alternative arrangements.

This is done through the:

- the “Operational Outages” register, which records forced interruption;
- the “Planned Outages” register, which records scheduled interruptions required for maintenance, testing and improvements;
- operational incident (forced outage) reports which describe remedial actions and provide recommendations;
- the “Reliability Measures Spreadsheet” which calculates the SAIDI, SAIFI and CAIDI performance;
- review of performance at monthly meetings.

In regard to performance over 10 years, records are available up to 2008 and show that interruptions over 12 hours occurred only once in the period, taking place within the 2011-12 period.

In regard to interruptions affecting small use customers more than 16 times in a year the performance records over 10 years show that this frequency of interruptions was exceeded only once in the period, occurring during this audit period, 2016-2017.

As this performance is in compliance with the Code, there was no obligation under the Code for the RIA to take any actions under this section, however some improvement actions have been identified and are in progress (refer to 'Improvement Actions' in section 3.2.2).

Summary

Table 5: Systems for monitoring compliance with interruption duration not to exceed 12 hours

Site	9 Years out of 10 (≤ 12 hours)	2017 # interruptions > 12 hours	Causes of Interruption Remedied / Alternative Arrangements
	Compliance		
All	Yes Complying between 2008 and 2017 (only one year interruption > 12 h (2011-12))	0 No small use customer affected	No action necessary.

Table 6: Systems for monitoring compliance with interruption frequency not to exceed 16 per customer per period

Site	9 Years out of 10 (# interruptions ≤ 16)	2017 # interruptions > 16 per period	2016 # interruptions > 16 per period	Causes of Interruption Remedied / Alternative Arrangements
	Compliance			
All	Yes Complying between 2008 and 2017 (only one year > 16 interruptions (2016-17))	5 zones affected with up to 17 interruptions per customers	0	No action necessary.

Note: it is noted that the Code and criteria have changed over the 10 year period.

3.3 SYSTEM TO MANAGE COMPLIANCE WITH PART 2, DIVISION 3, STANDARDS FOR THE DURATION OF INTERRUPTION OF SUPPLY IN PARTICULAR AREAS (SEC. 13)

Requirement: The licensee must establish systems to monitor compliance with the Code requirement to ensure that, so far as is reasonably practicable, the average length of interruptions to customer premises for the four years up to the current year for areas other than the Perth CBD does not exceed 160 minutes in urban areas and 290 minutes in any other area of the State.

There is a system in place to monitor compliance with the Code requirement that the average length of interruptions to customer premises for the four years up to the current year be kept to 290 minutes.

The audit found that the system includes:

- the procedure “PRO-RNI-I03-039-1 System Performance Measures SAIDI SAIFI CAIDI Procedure” which provides the instructions for the input and processing of data in the outage registers;
 - collection of outage data through recording of system events in the “Planned Outages Rottnest Island 2016-2017” and the “Operational Outages Rottnest Island 2016-2017” registers;
 - calculation of interruption figures in the “Reliability Measures Spreadsheet” which totals the interruption data for the four years up to the present year.
- ▶ At the end of the audit period the average length of annual interruptions to customer premises for the four years up to the current year was 386.08 minutes, which is in excess of the Code prescribed limit.

Factors which affected the increased interruption figure were analysed and included:

- the commissioning and operational start of the new 600 kW photovoltaic power plant, which incurred initial issues to determine the best operational settings;
- emergency generator changeover in February 2017 leading to the reconnection of the 11 kV line to the grid in March 2017;
- fuel supply loss (forced outage) in July 2016;
- major cable loss (forced outage) in February 2017 due to failure of an underground cable caused by pressure from tree roots on the cable insulation.

Preventive measures have been taken and have been reported in the sub-section ‘Improvement Actions’ in section 3.2.2. There was sufficient evidence to show that, in accordance with

subparagraph 13(2) of the Code, it was not reasonably practicable for the Licensee to comply with the prescribed interruption time.

It has to be noted that Rottnest Island uses the number of connection points as ‘customer premises’ for this calculation. The Code definition for “customer premises” is:

“customer premises means premises on which electrical installations are connected to a transmission or distribution system for the purpose of receiving supply”.

The figures used for ‘customer premises’ at Rottnest Island are connection points which include, among others, street lights, a desalination plant and bores, which are part of the Transmitter/Distributor assets, and accommodation units for which, seasonally, there may be high vacancy rates.

Summary

Table 7: Systems to monitor compliance with requirement for interruption not to exceed 290 minutes average per customer over 4 years.

Site	2017 (< 290 m)	4 Year Average (Avg over 4 years ≤ 290 min)
All	1077.14 using distribution connections	386.08 using distribution connections

Note: Definitions of customer numbers and connections were changed in 2011-2012. Calculations are based on 527 connections (which includes accommodation units) whilst previously 191 connections were used.

3.4 PROVISIONS MAY BE EXCLUDED OR MODIFIED BY AGREEMENT WITH CUSTOMERS (Sec 15)

Requirement: A customer and a transmitter or a distributor may agree in writing that a provision of this Part is excluded or modified in relation to the supply of electricity by the transmitter or distributor to the customer and the agreement must set out the matters that the parties consider are the advantages and disadvantages.

There are no agreements in place to exclude or modify provisions of this Part of the code.

4 Audit Summary and Recommendations

Under Section 26 "Annual report on monitoring systems" of the Code, Rottneast Island Authority is required to arrange for an independent audit of the operation of the systems that are in place to monitor its compliance with Part 2 of the Code or an instrument under Section 14(3).

The audit has found that Rottneast Island has in place systems which monitors the network performance for compliance with the requirements of the Code.

There were no recommendation and one Opportunity for Improvement (OFI) arising from the 2015 - 2016 audit, the OFI was considered and actions were taken during the audit period and presented to the auditor.

The audit and recommendations summary is provided in the next table. The table summarises the findings and recommendations of the report in regard to the system operation and compliance.

The table rates the various element as complying (✓), not in compliance (✘), or as actions in progress, observations or opportunities for improvement (OFI).

No findings were made in this audit.

Based on the scope of the audit defined in section 26 of the Code, Qualeng has found that the system and processes within RIA and PFM are in compliance with the requirements of Part 2 of the Code, "Quality and Reliability Standards".

Table 8: Systems Compliance Summary

Code Division, Section	Code Requirement	Evidence of System	Evidence of Process	Findings / Comments	Recommended Corrective Actions / Opportunities for Improvement (OFI)
	General System System to monitor compliance with requirements of the Code.			Operation of the systems which monitor Rottneest Island Authority's compliance with the Code, complies with the Code requirements.	
Div 1, Sec. 5 - 7	System to monitor compliance with quality and Reliability standards: voltage fluctuations, harmonics.	✓	✓	Measurements are systematic, initiated from the CMMS work management system and are carried out annually at peak demand time. There were no complaints from customers on quality of supply.	
		✓	✓	There were one-off spikes in short term fluctuations, however there were no continuous instances of spikes in excess of compatibility limits. ▶ There were long term fluctuations in excess of Code standards at two locations, Abbott Street Substation and Geordie Bay. These were identified by the licensee, recommendations made and actions are in progress.	
		✓	✓	Total Harmonic Distortion was measured and was in compliance.	

Code Division, Section	Code Requirement	Evidence of System	Evidence of Process	Findings / Comments	Recommended Corrective Actions / Opportunities for Improvement (OFI)
Div 1, Sec. 8	System to monitor compliance with duty to disconnect if damage may result due to electricity supply quality.	✓	✓	Disconnections are covered by procedures. Disconnections can proceed in case of complaints, inspections or observations and are documented.	
Div 2, Sec. 9	System to monitor compliance with maintaining the supply with a minimum number and duration of interruptions.	✓	✓	PFM monitors the number of interruptions, their duration, customers affected and causes. Interruption duration is colour coded in outage registers so that outages with excessive duration are highlighted.	
Div 2, Sec. 10	System to monitor compliance with reduction of effects of interruptions or provision for alternative supplies for proposed interruptions.	✓	✓	Procedures and processes are in place to monitor and reduce the effects of interruptions by providing alternative supplies, adopting restoration priority plans and providing information on outages to all customers.	
Div 2, Sec. 11	System to monitor compliance with length and <i>(continued below)</i>	✓	✓	PFM records and monitors the length of interruptions. No planned outages exceeded the duration requirements of the Code.	

Code Division, Section	Code Requirement	Evidence of System	Evidence of Process	Findings / Comments	Recommended Corrective Actions / Opportunities for Improvement (OFI)
	notifications for planned interruptions.	✓	✓	<p>A system is in place to issue notifications of planned interruptions and to maintain and monitor records.</p> <p>▶ Three planned interruptions received less than the prescribed advance notification however there was sufficient evidence to show that, in accordance with subparagraph 11(1)(b)(ii), it was not reasonably practicable to comply with the prescribed notice time.</p>	
Div 2, Sec. 12	System to monitor compliance with limiting significant interruptions to small use customers (≤ 16 times or ≤ 12 Hours) and to provide remedial action where breaches occur.	✓	✓	<p>Outage numbers are monitored.</p> <p>There is evidence of compliance with both requirements in 9 years out of 10. There is evidence of improvement actions.</p>	
Div 3, Sec. 13	System to monitor compliance with standards for the duration of interruption of supply in particular areas (30, 160, 290 min)	✓	✓	<p>Figures are monitored.</p> <p>▶ The standard was not maintained for this audit period, causes have been identified and improvement actions have been initiated. There was sufficient evidence to show that, in accordance with subparagraph 13(2), it was not reasonably practicable to comply with the prescribed interruption time.</p>	