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Audit Report

Horizon Power
2015 Network Quality and Reliability of Supply Performance Audit - Operation of Compliance Monitoring Systems

September 2015

Telephone:	+61 8 9260 0003
Fax:	+61 8 9225 7447
E-Mail:	projects@qualeng.net
Web:	www.qualeng.net
Postal Address:	PO Box Z5261, St George's Terrace, PERTH WA 6831
Office:	Level 2, 231 Adelaide Terrace, Perth, Western Australia, 6000

executive summary

Under the Electricity Industry (Network Quality and Reliability of Supply) Code 2005 (the Code), Division 3, Section 26, Horizon Power 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 2015 Horizon Power commissioned Qualeng to carry out the audit in respect of the operation of such systems to cover the period 1 July 2014 to 30 June 2015.

Horizon Power supplies electricity services to 38 systems consisting of 32 Non-Interconnected (or islanded) Systems in regional towns and remote communities, three systems (Kununurra, Wyndham and Lake Argyle) connected through a transmission network in the East Kimberley, two rural systems associated with Esperance and Hopetoun and the North West Interconnected System (NWIS). These systems include the Kimberley, Pilbara, Gascoyne, Mid West and Southern Goldfields regions. In addition to its own power generation plant, Horizon Power also purchases electricity from third parties.

The audit was conducted between August and September 2015 and included:

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

The audit found that out of the two recommendations made in the previous audit, actions have been identified and progress made:

- In response to the finding that there were no systems to monitor power quality in accordance with the Code, Horizon Power's action was to investigate, through the "Advanced Metering Infrastructure" (AMI) project, the capability of new meters used by Horizon Power (HP) in respect of power quality. However these meters have been found not to have the capability to measure voltage flicker and harmonic distortion. To date Horizon Power has not found a cost effective solution to monitor power quality. This

action has been wound up.

- In response to the finding that there was insufficient evidence that a system was in place monitoring compliance with the requirement of providing notifications at least 72 hours before each planned outage, Horizon Power has demonstrated that the Esperance office has a system that controls and records its notification compliance while the other offices have no comparable systems at this point.

In both cases the findings are still open and have been carried over to this audit period.

Horizon Power has a number of systems that monitor its performance against the requirement of the Code:

- the Electricity Network Management and Control system (ENMAC) and the Trouble Call System (TCS) monitor faults through customer calls, fault detection by field crews and the SCADA system and initiate investigations;
- the Asset Management Report monitors power quality incident numbers, interruptions over 12 hours, planned outages over 4 or 6 hours and where the frequency of interruptions is over 16 per customer;
- Power Quality Investigations look into faults and customer complaints regarding power quality issues; there is a process for work that may arise from the investigations to be included in the asset management work plans;
- customers with special health needs are registered and identified in the system;
- there are procedures for notification of planned outages, however, except for Esperance, these are not monitored;
- customers are compensated in respect of outages and insufficient notifications where applicable;
- alternate power supplies are available to mitigate interruptions;
- there are systems in place monitoring interruptions over 12 hours, when frequency of interruptions is over 16 per customer per year and overall duration of interruptions per customer over 4 years.

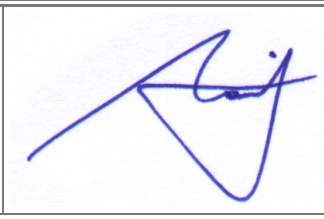
As well as the findings open from the previous audit two additional findings were recorded on completion of the audit:

- A number of documents related to the monitoring of power quality are in need of review to see whether they are still up to date or applicable.
- No procedure addressing power quality measurement in the field was in evidence during the audit.

Based on the scope of the audit defined in section 26 of the Code, and except for the findings noted above, Qualeng has found that the operation of Horizon Power's systems which monitor compliance with the requirements of the Code, is in 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 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 / Engineering Manager, Qualeng	22/9/2015

Issue Status

Issue No	Date	Description	Approved
1	21/9/2015	First Formal Issue	MZ
2	22/9/2015	Updated Executive Summary and minor corrections	MZ

TABLE OF CONTENTS

1 Objectives and Scope of Audit

1.1 Introduction

Horizon Power has an Electricity Integrated Regional Licence (EIRL2 Licence) (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 Horizon Power supplies electricity to approximately 100,000 residents and 10,000 businesses, including major industry. The services are provided to an area of approximately 2.3 million square kilometres extending from the Kimberley in the North to Esperance, Norseman and Hopetoun in the South and including the Kimberley, Pilbara, Gascoyne, Mid West and Southern Goldfields regions in Western Australia. Services are provided through 38 systems including 32 Non-Interconnected (or islanded) Systems in regional towns and remote communities, three systems (Kununurra, Wyndham and Lake Argyle) connected through a transmission network in the East Kimberley, two rural systems associated with Esperance and Hopetoun and the North West Interconnected System (NWIS). In addition to power generating plant in Carnarvon, Marble Bar, Nullagine, Kununurra and Wyndham, Horizon Power also owns generating plant that is managed by a third party and purchases electricity from third parties.

Under the terms of the Act Horizon Power 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, Horizon Power 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 2015 Horizon Power commissioned Qualeng to carry out the Performance Audit to cover the period 1 July 2014 to 30 June 2015.

The audit has been conducted and this report prepared in accordance with the Code.

1.2 Audit Objectives

The purpose of the Network Quality and Reliability of Supply (NQRS) 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 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 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 2015.

On Horizon Power's behalf the following representatives participated in the audit, contributed to sourcing the documentation and providing evidence to the audit:

- Mr Justin Murphy, Manager Asset Management Support
- Mr Simon Duggan, System Manager
- Mr Gerard Chow, Data Management Officer
- Mr Luke Boswarva, Risk & Internal Auditor

The main auditing team members were Mr M Zammit, Lead Auditor and Mr S Campbell, Reviewer.

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 and
- reporting.

The audit proceeded through a documentation review, meetings and checks of processes. These were supported by additional queries to clarify aspects of Horizon Power 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
CAIDI	Customer Average Interruption Duration Index
Code	Electricity Industry (Network Quality and Reliability of Supply) Code 2005
ENMAC	Electricity Network Management and Control
HV	High Voltage
LV	Low Voltage
NWIS	North West Interconnected System
PQ	Power Quality
PQI	Power Quality Investigation
SAIDI	System Average Interruption Duration Index
SAIFI	System Average Frequency Duration Index
SCADA	Supervisory Control and Data Acquisition
SWIS	South West Interconnected System

Abbreviation	Description
TCS	Trouble Call System
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 2014. This section reviews Horizon Power's progress on that audit recommendations as well as Horizon Power's planned actions to address any outstanding issues.

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

2.2 PROGRESS OF ACTIONS FROM 2014 AUDIT

The following table lists the recommendations made in the 2014 Audit and records progress of any actions.

Item No	Code Ref	Requirement	Findings	2014 Recommendations and Opportunities for Improvement	Status
		Systems to monitor compliance with:			
1	Div 1, Sec. 5 - 7	**Quality and Reliability standards, voltage fluctuations, harmonics:** 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.	▸ There is no process for routine measurement of power quality at the customer connection. No records were available of flicker or harmonics measurements at customers connections.	**1/2014.** Provide monitoring of compliance of power quality in respect of flicker and harmonics at customer connections (open from 2011 - 2012 period).	There has been no resolution of the recommendation during the audit period. An "Advanced Metering Infrastructure" (AMI) project was initiated which considered the capability of new meters used by Horizon Power (HP). However these meters have been found not to have the capability to measure flicker and harmonics. HP has concluded that there is no cost effective solution to this issue. The status of the finding is as per previous audit **Open, carried to the findings of the 2015 audit.**
2	Div 2, Sec. 11	**General standard of reliability** System to monitor compliance with maintaining the supply with a minimum number and duration of interruptions.	▸ There is a system for reporting, at the end of the auditing period, inadequate notifications if there are customer complaints.	**2/2014.** Monitor and report against the requirement of providing notifications at least 72 hours before each planned	HP system for monitoring advance notification is still primarily reactive. Esperance is the only district with a full paper system so that notifications for planned outages are recorded.

Item No	Code Ref	Requirement	Findings	2014 Recommendations and Opportunities for Improvement	Status
			However there is insufficient evidence that a system was in place throughout the audit period monitoring compliance with the requirement of providing notifications at least 72 hours before each planned outage.	outage.	**Open, carried to the findings of the 2015 audit.**

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:

- power quality requirements of the electricity supply at the point of connection to the customer, both in terms of voltage fluctuations and harmonic distortion and
- 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)

Horizon Power has reactive systems in place for monitoring compliance with the Code power quality requirements at the point of connection to the customer. The systems rely on reporting of power quality faults through customer raising complaints.

- There are no systems in place to monitor that the electricity supply quality (for flicker and harmonics) is in compliance with the Code power quality standards at the customer connection except for reactive response to faults and complaints.
- There was no evidence of procedures for field measurement of flicker or harmonics during the audit.

The "Field Instruction Manual (CS10 # 2224539)", May 2014, provides the procedures for the performance of tasks in the field, however:

- The manual does not include any instruction for measurement of voltage fluctuations (flicker) and harmonics.
- The audit did not see any reports recording traces of flicker or harmonics.

Horizon Power's "Distribution Design Manual Volume 1 – Quality of Electricity Supply" provides for calculation of flicker through "virtual" meters or software applications such as "FlickPlus". The manual also provides for design calculations of harmonics. Procedures for calculation of flicker and harmonics for network design are documented in the "[CS10#816823v1] Flicker Allocation Manual" (HP 3275278) and the "[CS10#816822v1] Harmonics Allocation Manual" (HP 3275276). Both of these are legacy documents originally prepared by Western Power and last revised in November 2009.

The overall policy is currently documented in the "AMP Instruction Module 2012/13 Module 7 – Quality," (HP_3233258), which provides the requirements and an outline of the process for managing and documenting the quality of power supply, however:

- This document is dated November 2012 (due for review in November 2013) and some of the content and information appears out of date, such as the organisation structure and the statement that data for harmonics and electromagnetic interference in the North West Interconnected System (NWIS) is being collected (which does not appear to be correct) whilst the system is reactive elsewhere.

The process for responding to customer calls in relation to faults (and quality) is documented in the "ENMAC TCS Call Taking Procedure", (HP 3191123) which includes the instructions for recording and resolution of calls and fault handling. The Trouble Call System (TCS) manages the faults and power quality incidents identified in the networks and affecting customers. Field crews are required to attend faults which can then be remedied immediately and/or subject to investigation. Faults are also reported by the SCADA monitoring equipment and by field crews.

The "Power Quality Investigations - Handbook" (DM# 3274139), dated May 2010, details the process to be followed for the resolution of power quality (PQ) incidents. This document also appears in need of review.

PQ incident data is reported in "Asset Management Reports" on a monthly basis and published on Powerlink, Horizon Power's dashboard, as key performance indicator for PQ. Both corporate office and the Districts monitor this KPI as part of their PQ Monitoring process. More detailed reports, like the "0382 - AMR PQI Complaints" are also published showing more detailed information about each PQI and its results. The audit reviewed Powerlink for the range of reports that are published and sighted monthly reports to 2010.

Over the year Horizon Power reported that there were 32 PQ Complaints which were investigated. Not all power quality issues fall under the scope of the Code, most PQ investigations determined that the majority of the faults were high or low voltage, a number of incidents related to voltage fluctuation which in most cases was due to equipment damage due to birds or breakdown.

PQI findings are analysed by the regions and, in accordance with the "[CS10#2586228v1] Asset_Management_Plan__Instruction_Guide", PQ issues, if any, are addressed in projects which are then included in the following year asset management plan.

As part of the "Advanced Metering Infrastructure (AMI) Project" Horizon Power selected a range of Direct Connection (whole current) and CT/VT AMI meter types and reviewed their capability in regard to monitoring flicker and harmonics, none of the meters, however, had that capability.

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

The fault handling process allows the field crews, in conjunction with the power system "Controller", to

disconnect supply where required.

A Field Instruction, the "FI 5.1, Customer Defective Electrical Equipment", provides the instructions to the field crew for disconnecting customer electrical connection when the customer's electrical equipment is found to be defective.

3.1.3 Summary of power quality monitoring findings

The following findings have been made on the operation of systems, processes and practices dealing with monitoring the quality of supply:

Table 1: Systems to monitor compliance with requirements for quality of supply

Site	Flicker (Pst ≤ 1.0; Plt ≤ 0.8)	Harmonics (THD ≤ 8%)	Customer Complaints or Faults Related to PQ
All	▸ Reactive system. No measurements available	▸ Reactive system. No measurements available	None of the PQ Incidents or customer complaints assessed as power quality incidents related to the Code.

Findings:

1/2015. There is no evidence of compliance of electricity supply voltage flicker and harmonic distortion to requirements specified under sections 6 and 7 of the Code. There is no process for routine measurement of power quality (for flicker and harmonics) at the customer connection. No records were available of flicker or harmonics measurements at customers connections.

2/2015. A number of documents related to the monitoring of power quality are in need of checks to see whether they are still up to date or applicable.

3/2015. No procedure addressing power quality measurement in the field was in evidence during the audit.

3.2 System to manage compliance with Part 2, Division 2, Standards for Interruption of Supply

The Licensee has to comply with requirements for the management of 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.
- Reduce the effects of interruptions; provide alternative supply if the proposed interruption is

expected to be significant, its effect substantial or if the customer has special health needs that require continuous supply.

- 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.
- 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.

3.2.1 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 interruptions is kept to a minimum.

Horizon Power has a system in place to respond to interruptions and monitoring the performance of the system. The process includes:

- "ENMAC TCS Call Taking Procedure", (HP 3191123) which includes the instructions for recording and resolution of calls and fault handling;
- the Trouble Call System (TCS) manages the faults identified in the networks and affecting customers. Field crews are required to attend faults which can then be remedied immediately and/or subject to investigation;
- the monthly "Asset Management Report" (AMR) provides continuous monitoring of the number and duration of interruptions, YTD and compared to previous year, SAIDI, SAIFI and CAIDI by township with colour coding for breaches of reliability targets;
- more detailed reports on outages such as:
  - "[CS10#1914859v42] 0387 Horizon Power Planned Outages Outside Charter Report" (HP_3299471);
  - "[CS10#1888291v28] 0416 AMR (Asset Management Report) - 16 Outage Detail Report" (HP_3615403);
  - "[CS10_1921690v39] 0386 AS&C - Customer Outages - 12 Hours" (HP_3283015);
- high level responses to emergencies such as the "[CS10#2375670v10] Crisis and Emergency Management Plan" and the "[CS10#805576v5.14] Communications Crisis and Emergency Management Plan" (HP_3268792).

The AMR reports monthly on the essential parameters required for monitoring performance of the network for compliance with the Code:

- the number of customers subjected to more than 16 interruptions in the year by region;

- the number of interruptions over 12 hours duration by region and YTD compared to previous period;
- the number of planned outages over 4 or 6 hours duration (as applicable) by region and YTD compared to previous period;
- the number of outstanding Incidents over 7 days old in TCS;
- the SAIDI, SAIFI and CAIDI performance, (ie. 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 respectively) over the period (p 8);
- the non performing feeders in terms of interruptions (SAIDI), by Transmission and Distribution causes as well as by Generation causes.

Summary:

Table 2: Systems to monitor compliance with requirement to maintain supply 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 Reduction of effects of interruptions and provision for alternative supplies for proposed interruptions (Sec. 10)

Requirement: The licensee must establish systems to monitor compliance with its duty to reduce the effect of any interruptions and consider providing alternative supply for proposed interruptions if the interruption is greater than 4 or 6 hours, or there is a substantial effect on the business or there are special health needs customers.

Reduce the effect of any interruptions

Horizon Power has systems in place to monitor compliance with its duty to reduce the effects of any interruption.

Customer interruptions are monitored through the Trouble Call System (TCS) provided as a part of the Electricity Network Management and Control system (ENMAC). Faults can be reported through customer calls, by Horizon Power's crews or by the SCADA equipment. ENMAC records when a customer's supply is interrupted and restored, the incident dispatch details, restoration actions. Causes of the faults including any associated equipment failure are also recorded.

The field crew priority on attendance to the fault, after ensuring it is safe to do so, is to rectify the fault and restore supply.

The system documentation includes:

- procedure "ENMAC TCS - Call Taking To Be Processes" provides the step by step recording and resolution of calls and fault handling;
- incident reports show that significant steps taken by the crew attending the fault are recorded by action and time stamp. Incidents remain open until the fault crew restores power to the customer and provides confirmation of restoration of supply to Horizon Power Control Centre (HPCC). The incident is fully closed once the Power Services Officer completes the "Fault Report";
- "CS10#1694488v4] Priority Restoration Basic Process Flow (HP_3652541)" provides the overall process flow with more details for the Fault Crew and HPCC. It links to the "Priority restoration register" and the "[CS10#622450v2] Critical Customer Procedure (HP 3159928)" which sets up the priorities for power restoration;
- [CS10#1794556] ENMAC Network Management Procedure (HP 3178414)", provides uniform operating requirements for the use of the ENMAC network management system across Horizon Power at the operational level within Horizon Power. It provides directions for HPCC, Regional Managers and Districts, SCADA Services and Asset Managers. Switching Authorisations are managed to ensure staff can write, check and execute switching programmes.

The "Critical Customer Procedure" stipulates that advance notification of outages are to be given to customers from 3 weeks to 3 days prior to the outage.

Performance of the system is monitored through the monthly AMRs and the weekly outage reports published on Horizon Power's public drive. The AMRs report on outages over 4 or 6 hours and interruptions over 12 hours, performance is compared year on year and colour coded to show improvement or deterioration. Detailed weekly spreadsheets report on those incidents, highlighting those that are open. Regional offices monitor the report and take action to close the incidents.

Provision of Alternative Supply, Special Health Needs Customers and Commercially Sensitive Loads

Horizon Power has systems in place to monitor compliance with the requirement to reduce the effects of planned interruptions.

The"[CS10#622450v2] Critical Customer Policy/Procedure", (HP_3159928), stipulates that advance

notification of outages are to be given to customers from 3 weeks to 3 days prior to the outage depending on their criticality ranking. Particular businesses and organisations have high ranking. Critical customers power restoration is also prioritised over non-critical customers.

The "Horizon Power Outage Management Process" (DM 3488293) provides guidelines for responses to outages that have an effect on customers' supplies, in particular it defines:

- planned outage management process
- crisis and emergency management
- unplanned customer outages
- fault crew outage management process.

Through review of "Horizon Power Control Centre Outage Management Process" and discussion with Horizon Power's staff the audit found that fault management procedures include consideration for:

- bypassing faults;
- using Independent Power Providers (IPP) or
- mobile equipment to provide alternate power generation;
- supply restoration plans including feeder rotation and district priority feeder plans to re-establish supply in a timely manner;
- arrangements to provide alternative supply through mobile equipment.

The Critical Customer Policy/Procedure defines the need to:

- contact SN customers by phone no less than 5 days before a planned outage;
- notify SN customers by "carded" letterbox drop a minimum of 3 days before the outage.

The "[CS10#2001125v56] Customer Service Policy" of March 2015 sates that:

- SN customers shall be given no less than 3 days written notice of an intended planned outage;
- that the customer should not be disconnected, and
- that Life Support Lists be updated at least monthly and when new SN customers are registered.

"CS_Framework process map_Life Support", under the "Customer Service Framework", DM 3412209, documents the processes for registering and maintaining the records for SN customers. Customer information is uploaded by Gentrac Velocity (the customer services application) into ENMAC/TCS on a nightly basis. Identification of SN customers and commercially sensitive loads is provided on the system panels, the "HV Network" diagram (the online schematic display of the network which has online real-time system status).

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 Health Needs Customers
All	Yes	Yes	Identified

3.2.3 Planned interruptions acceptable if less than 4 or 6 hours and if notified (Sec. 11)

Requirement: The licensee must establish systems to monitor compliance with the requirement to maintain planned outages not exceeding 4 or 6 hours and providing notifications at least 72 hours before each planned outage.

Horizon Power has a system to manage and monitor planned outages. While a process is in place to provide advance notifications to customers, except for the Esperance office, there is no recording or monitoring of compliance with the Code.

Planned Outages Not Exceeding 4 or 6 Hours

Planned outages exceeding 4 or 6 hours are reported in the "0387 AMR Planned Outages Outside Charter" report (listing outages exceeding 4 or 6 hours) as totals per town and District, and individually by outage.

Outage numbers are monitored on the monthly AMRs which show the YTD performance compared to the previous year, including commentary on trends.

There were 53 planned outages exceeding the specified duration in the audit period compared to 65 for the previous period (2013 - 2014).

Planned Outage Notifications

The planned outage notification process is defined in the "CS - Framework Process Map - Notification Of Planned Outages" (HP3722547) document.

- The process requires double checking to verify that customers have been notified however, except for the Esperance office, there is no documentary system providing evidence that timely delivery of notifications is recorded and monitored.

Reporting of non compliance with the notification requirements relies on the customer making

complaints. Customer rights are identified in the "Customer Service Policy" and the payment process is documented in the "[CS10#1884598v1] CS - Framework Process Map - Planned Outage Claims".

The audit confirmed that evidence was available of adequate notification in the Esperance region through the use of the "Regional Planned Outage Notification" and the "Outage Notification Request" forms.

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	Notification ≥ 72 hours prior	Duration ≤ 4h or 6h (as practicable)
All	▸ Except for the Esperance office reporting is reactive in response to customer complaints and no monitoring is in place.	Monitored 53 planned outages > 4 or 6 hours

4/2015. While there is a system for providing notifications and reporting inadequate notifications (following customer complaints), except for the Esperance office there is insufficient evidence that a system was in place throughout the audit period monitoring compliance with the requirement of providing notifications at least 72 hours before each planned outage.

3.2.4 Significant interruptions (over 12 hours duration or more than 16) to small use customers (Sec.12)

Requirement: The licensee must establish systems to monitor compliance with the requirement to remedy the causes of interruptions or make alternative arrangements where significant interruptions (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.

The audit has found that there is a system for monitoring compliance with the requirements to remedy the causes of significant interruptions or make alternative arrangements so that the prescribed standard is met.

Significant interruptions are monitored through reports:

- interruptions over 12 hours duration are tracked through the " 0386 AS&C - Customer Outages -

12 Hours", which lists the number of incidents together with the number of customers affected by towns and Districts by month and YTD;

- interruptions over 12 hours duration are tracked in the monthly AMR;
- data for customers that experience more than 16 interruption in the audit period are reported in the " 0416 AMR (Asset Management Report) - 16 Outage Detail Report" which include monthly and YTD figures;
- data for customers that experience more than 16 interruption in the audit period are also tracked in the monthly AMR.

Horizon Power reports the end of year figures in the "2015 code report - Network Quality and Reliability of Supply". At the end of the audit period there were a total of 6,382 premises interruptions over 12 hours compared to 3785 in the previous period. A number of interruptions were caused by cyclones Olwyn and Quang (March and May 2015 respectively).

Over the audit period there were 106 instances of premises that experienced more than 16 interruptions compared to 1263 in the previous period.

Remediation

Horizon Power's has long recognised that the overall system performance was affected by poor reliability in some of the townships. In the previous period the townships of Wyndham, Onslow and Kununurra had been identified as poor performers and measures had been taken over successive periods to improve their reliability:

- Wyndham is supplied by an IPP through a feeder from Kununurra. Historically the supply has been unreliable, to overcome this auto start generators have been installed providing back up power when the IPP or the feeder break down;
- Onslow is also supplied by an IPP, mobile generators have been brought in to provide back up power when interruptions are experienced. Incident occurrence has been significantly reduced;
- Kununurra receives its supply from an IPP and the supply is also unreliable; a number of reliability projects have been implemented and have resulted in the decrease of the frequency of interruptions (SAIFI dropping from around 20 in 2012/13, to 17.6 in 2013/14 and 10.7 in 2014/15.

Summary

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

Site	2015 > 12 hours	9 Years out of 10 (≤ 12 hours)	Causes of Interruption Remedied / Alternative Arrangements
		Compliance	
All	6,382 premises affected	Not available	Major causes were identified for interruptions > 12h Main contributors to interruptions were identified and alternative arrangements implemented.

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

Site	2015 > 16#	9 Years out of 10 (≤16#)	2014 > 16#	Causes of Interruption Remedied / Alternative Arrangements
		Compliance		
All	106 premises	Not available	1263 premises	Major causes were identified; there is evidence of remediation.

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 the average total length of interruptions per customer for the four years up to the current year for areas other than the Perth CBD do not exceed 160 minutes in urban areas or 290 minutes in any other area of the State.

Horizon Power has implemented a system that monitors both the length of interruption of supply to each customer of every town and sets targets for each town to achieve a complying supply for the

entire network.

The overall four year average is 373 minutes for the four years up to 30 June 2015, which is higher than the required figure however the figure is inclusive of interruptions due to external factors outside of Horizon Power's control. The figure for the 2015 audit period is 501 minutes which is a deterioration from last period figure of 335 minutes.

Horizon Power also performs the calculation excluding major external events such as storms cyclones, floods, vehicle, vandalism etc. The resulting data is defined as "Normalised Data" and corresponds to the network performance within Horizon Power's control. Once the external causes are removed the audit period figure is reduced from 501 to 135 minutes (improved from last period figure of 155 minutes).

The average over the last four years, inclusive of 2015, was greater than 290 min in 13 out of 36 systems (including 34 town sites and the NWIS and Kununurra systems).

Summary

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

Site	2015 (≤ 290 m)	4 Year Average (Avg over 4 years ≤ 290 min)
		Figures have been calculated over 4 years up to 2015.
All sites	501	373

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.

Horizon Power has entered into agreement with a limited number of customers to interrupt the supply by following a documented procedure. Horizon Power benefits through demand management and the customer through financial benefits.

4 Audit Summary and Recommendations

Under Section 26 "Annual report on monitoring systems" of the Code, Horizon Power 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 Horizon Power's systems monitoring compliance with Part 2 of the Code are in general compliance with the requirements of the Code, except as noted below.

There were two recommendation arising from the 2013 - 2014 audit. The audit found that both actions are still open and have been included in this year findings:

- Horizon Power does not carry out routine monitoring of power quality at customer connections as required by the Code. Monitoring at customer connections is reactive and is carried out when there is a power quality complaint by customer(s). There was no evidence of compliance of electricity supply voltage flicker and harmonic distortion to requirements specified under sections 6 and 7 of the Code.
- While there is a system for providing notifications and reporting inadequate notifications (following customer complaints), except for the Esperance office there is insufficient evidence that a system was in place throughout the audit period monitoring compliance with the requirement of providing notifications at least 72 hours before each planned outage.

There were no "Opportunity for Improvement" raised in the previous audit.

In addition to the actions still open from the previous audit, the audit made two new finding:

- A number of documents related to the monitoring of power quality are in need of checks to see whether they are still up to date or applicable.
- No procedure addressing power quality measurement in the field was in evidence during the audit.

Table 8 below provides a summary of the findings and recommendations of the report in regard to the system operation. The table rates the various element as complying (✔), non-complying (✖), or as actions in progress, observations or opportunities for improvement (**OFI**).

Throughout the audit it was evident that staff were aware of the Code requirements and there was commitment to improvement of the system compliance.

Based on the scope of the audit defined in section 26 of the Code, Qualeng has found that, except for the findings recorded above, the system and processes within Horizon Power 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	Operation of the System Findings / Observations	Recommended Corrective Actions / Opportunities for Improvement (OFI)
	General system Systems monitoring compliance with the requirements of the Code.	✔	✔	Operation of the systems which monitor Horizon Power's compliance with the Code, complies with the Code requirements except for the findings reported below.	
Div 1, Sec. 5 - 7	System to monitor compliance with quality and Reliability standards: voltage fluctuations, harmonics.	✔	✔	The system monitored power quality complaints and no complaint was identified as due to quality of supply as defined by the Code.	
		✖	✖	▸ There is no process for routine measurement of power quality at the customer connection. No evidence of compliance of electricity supply voltage flicker and harmonic distortion to requirements specified under sections 6 and 7 of the Code. No records were available of flicker or harmonics measurements at customers connections.	No further recommendation made. A recommendation was open since the 2011-12 period to provide monitoring of compliance of power quality in respect of flicker and harmonics at customer connections. Horizon Power has assessed options and concluded that at this point solutions are too costly.
				▸ A number of documents related to the monitoring of power quality need to be checked to see whether they are still up to date or applicable.	**1/2015.** Review and. if applicable, update documents related to power quality.
				▸ No procedure addressing power quality measurement in the field was in evidence during the audit.	**2/2015.** Document a procedure for measurement of power quality in the field.

Code Division, Section	Code Requirement	Evidence of System	Evidence of Process	Operation of the System Findings / Observations	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 power quality.	✔	✔	Fault responses are documented. Responsibility to disconnect customers remains with the service crew. Field Instruction covers disconnection where fault is due to customer.	
Div 2, Sec. 9	System to monitor compliance with maintaining the supply and minimise the number and duration of interruptions.	✔	✔	Procedures and processes are in place to monitor and to attend to faults and interruptions and restore supply as early as possible.	
Div 2, Sec. 10	System to monitor compliance with reduction of effects of any interruption and consideration of alternative supplies for proposed interruptions where it affects business or special health needs customers	✔	✔	Monthly reports are in place to monitor compliance. Priority of crews attending interruptions is to restore supply. Alternative supply is used to reduce the effect of interruptions. There is a formal system for managing special needs customers.	
Div 2, Sec. 11	System to monitor compliance with length (less than 4 or 6 hours) and notifications for planned interruptions.	✔ ✖	✔ ✖	There is a system for monitoring length of proposed interruptions. Planned outages lasting over 4 hours are reported and causes identified. ▸ Overall there is a reactive system for reporting inadequate notifications (relying on customer complaints) except for Esperance office which has a complying paper system. As Horizon Power is relying on others, the customers. for controls	**3/2015.** Monitor and maintain records against the requirement of providing notifications at least 72 hours before each planned outage.

Code Division, Section	Code Requirement	Evidence of System	Evidence of Process	Operation of the System Findings / Observations	Recommended Corrective Actions / Opportunities for Improvement (OFI)
				(through complaints) there is insufficient evidence that Horizon Power has a system in place monitoring compliance with the requirement of providing notifications at least 72 hours before each planned outage.	
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.	✔	✔	A system is in place to monitor the number of interruptions greater than 12 hours or where the frequency of interruptions exceeds 16. Overall there was an increase in length of interruptions and a decrease in the number of interruptions per customer.	
		✔	✔	Remedial actions have been taken to remove some of the causes of major interruptions.	
Div 3, Sec. 13	System to monitor compliance with standards for the duration of interruption of supply in particular areas (≤ 30, 160, 290 min)	✔	✔	There are systems in place to monitor compliance. Monthly reports monitor the duration of interruptions. The average over four years is 373 min which is above the 290 min limit. Removal of major event days reduces the figure to acceptable levels which implies that external factors have affected Horizon Power's performance.	
Div. 4, Sec. 15	Systems to monitor compliance with provisions may be excluded or modified by agreement	✔	✔	Complies.	