



ABN 20 009 454 111

Audit Report
Horizon Power
2013 Network Quality and Reliability of Supply
Performance Audit -
Operation of Compliance Monitoring Systems

September 2013

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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 June 2013 Horizon Power commissioned Qualeng to carry out the audit in respect of the operation of such systems to cover the period 1 July 2012 to 30 June 2013.

Horizon Power supplies electricity services to 38 isolated networks and two interconnected systems including the North-West Interconnected System (NWIS) in the Pilbara and the East Kimberley Interconnected System, a transmission network including Kununurra, Wyndham and lake Argyle. These systems extend from the Kimberley in the North to Esperance in the South and 5 remote Aboriginal communities. In addition to its own power generation plant, Horizon Power also purchases electricity from third parties.

The audit was conducted between August and September 2013 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 the action arising from the one recommendation made in the previous audit is still in progress:

- While there are procedures to guide the measurement of power quality, there are no systems to monitor compliance with flicker and voltage harmonics criteria. No measurements of individual harmonics was carried out in the audit period.

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

- the Trouble Call System (TCS) and Power Quality Investigations monitor customer

complaints, faults and investigations of customer complaints in regard to power quality issues;

- planned outages over 4 and 6 hours are monitored and reported in the Asset Management Report;
- customers with special health needs are identified in the system;
- there is a procedure for notification of planned outages and provision for identifying outages over 4 or 6 hours as well as compensating customers where applicable;
- alternate power supplies are made available to mitigate interruptions;
- there are systems in place monitoring interruptions over 12 hours, frequency of interruptions over 16 per customer per year and overall duration of interruptions per customer over 4 years.

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

- there was no monitoring of the number of all interruptions, including both planned and unplanned, that were greater than 4 or 6 hours duration, as required by section 9 of the Code;
- there was no clear evidence that causes of excessive interruption frequency (i.e. frequency > 16) for the preceding period (2011 - 2012) had been remedied in 2012 - 2013 or alternative arrangements made, as required by the Code under section 12.

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 the systems within Horizon Power 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".




Audit Report

HORIZON POWER 2013 NETWORK QUALITY AND RELIABILITY OF SUPPLY PERFORMANCE AUDIT - OPERATION OF COMPLIANCE MONITORING SYSTEMS Ref 54/16

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 review 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	23/09/2012

Audit Team

Audit Team	Description
M Zammit	Project Director and Lead Auditor

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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 services to 38 townships and isolated networks isolated from the South West Interconnected System (SWIS). These extend from the Kimberley in the North to Esperance in the South, 5 remote Aboriginal communities, the North West Interconnected System (NWIS) in the Pilbara and the East Kimberley Interconnected System. In addition to its own power generation plant, Horizon Power also 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 June 2013 Horizon Power commissioned Qualeng to carry out the Performance Audit to cover the period 1 July 2012 to 30 June 2013.

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 2013.

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

- Mr Robert Kerrigan, Asset Strategy Engineer
- Mr Gerard Chow, Business System Analyst, Operations Division Asset & Work,

Mr Frank Buttigieg, Regulation Compliance Coordinator, coordinated the audit on behalf of Horizon Power.

The main auditor representatives 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 Guidelines: Electricity, Gas and Water Licences", August 2010 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 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
LV	Low Voltage
NWIS	North West Interconnected System
SAIDI	System Average Interruption Duration Index
SAIFI	System Average Frequency Duration Index
SWIS	South West Interconnected System
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 2012. 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.



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2.2 PROGRESS OF ACTIONS FROM 2012 AUDIT

The following table lists the recommendations made in the 2012 Audit and records progress of any actions.

Item No	Code Ref	Requirement	Findings	Recommendations and Opportunities for Improvement	Status
1		<p>General system</p> <p>Systems monitoring compliance with the requirements of the Code.</p>	<p>Operation of the system monitoring compliance with the Code meets the Code requirements except for the findings noted below.</p>	<p>1. (OFI) There is an opportunity to review and improve the link and traceability between outages/incidents/power quality investigations and associated information, such as investigations, reports.</p>	<p>Traceability is in place between the Trouble Call System (TCS) faults and the power quality investigations. Outages are identified and reported. Completed</p>
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>No records were available of flicker or harmonics measurements at customer connections. There is no systematic sampling of power quality at customer connections.</p>	<p>2. Start and monitor program of power quality measurements at customer connections.</p>	<p>HP still carries routine monitoring at substation busbars and not at customer connections. Monitoring at customer connections is reactive and is carried out when there is a power quality complaint. Open</p>
3	Div 2,	<p>Significant interruptions to</p>	<p>There is no capability in the</p>	<p>3. (OFI) Consider analysis of the</p>	<p>Horizon Power employs a</p>



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Item No	Code Ref	Requirement	Findings	Recommendations and Opportunities for Improvement	Status
	Sec. 12	<p>small use customers (> 16 times or > 12 Hours).</p> <p>System to monitor compliance with duty for remedial action where significant interruptions to small use customers (> 16 times or > 12 Hours).</p>	<p>present reporting system to identify the causes for excessive frequency of interruptions (where frequency > 16).</p>	<p>causes of frequency of interruptions.</p>	<p>process for monitoring excessive frequency of interruptions. The Cognos Express reporting system is used to identify incident location by feeder and nearest protection device. Reporting of interruptions is provided to Horizon Power's management in the "Asset Management Report". Completed</p> <p>A finding related to remedial action in the case of excessive frequency of interruptions has been noted for the current audit period (refer to section 3.2.4)</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)

Systems to monitor power supply quality are reactive, responding to customer complaints or faults. Horizon Power has written procedures and processes in place to manage faults, rectification and investigation, however there are no processes for routine measurement of power quality (in respect of flicker and harmonics) at the customer connection.

- ▶ 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.

The "Operations Division AMP Instruction Module 2012/13 Module 7 – Quality" documents the process for managing and documenting the quality of power supply. The Trouble Call System (TCS) manages all faults and power quality incidents experienced on the networks and affecting customers. A procedure, the "ENMAC TCS - Call Taking To Be Processes" (DMS#3191123 v4) provides the step by step recording and resolution of calls and fault handling.

Progressive monitoring of fault investigations is provided in monthly reports, the "Electricity Delivery and Systems Reliability Report" and the "Asset Management Report".

Power quality measurements are performed at the transformers and at the LV network as part of the annual checks for loads, voltage levels and frequency. No flicker or harmonics measurements are taken in these tests. As noted above the power quality measurements tasks are reactive, in response to customer complaints and preliminary fault investigation. Procedures for taking those measurements are documented in the "Harmonics Allocation Manual" and the "Flicker Allocation Manual".

Investigations such as Power Quality Investigations (PQI) are initiated in response to faults. Faults can be reported by customers, by Horizon Power's crews or by the SCADA equipment.

Not all PQIs result in full investigations as the fault can be rectified in the first instance by the field crews. On the other hand more complex solutions may require the work to be planned in the next Area Work Plan and become a project.

Most of the investigations have found that the causes of the " power quality" complaints or faults are:

- trees touching the lines
- equipment malfunctions which are repaired as part of the process or
- customer related
- voltage levels.

None of the complaints or faults has been traced to voltage fluctuations (flicker) or harmonics.

Customers are advised of the proceedings and conclusion of investigations.

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. In addition Horizon Power has implemented "Field Instructions" which are issued to field crews within a booklet and continually maintained. The Instructions allow the field crews to disconnect the customer if they determine that the customer installation may be damaged due to it being unsafe or due to defects in the customer installation.

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 Related to PQ
All	▶ No measurements available	▶ No measurements available	Not confirmed as power quality investigations.

Finding:

1. 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.

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.

As noted in section 3.1.1, Horizon Power has systems in place, the TCS system and the procedure "-Call Taking To Be- Processes", to manage and monitor customer complaints, faults and interruptions. Results of incident attendance are reported monthly in the "Electricity Delivery and Systems Reliability Report" and the "Asset Management Report" which monitors SAIFI, SAIDI, CAIDI and PQIs. In addition the "Asset Management Report" provides:

- the number of customers that are subject to interruptions over 12 hours;
- the number of customers that are subjected to more than 16 interruptions in the year and
- the number of planned outages that are outside charter (> 4 or >6 hours duration).

The Code does not make distinction between forced (unplanned) and planned outages and requires that there should be monitoring of compliance of all outages, both in terms of number and duration. Currently Horizon Power provides this by reporting SAIDI, SAIFI and CAIDI performance but not directly reporting the number of all interruptions that are greater than 4 or 6 hours duration.

- ▶ There was no directly reporting of the number of all interruptions that were greater than 4 or 6 hours duration.

Fault management procedures include consideration for bypassing faults, thus securing alternative supplies or requesting alternative power generation. Completion of each step of the TCS process is recorded by date and time, this allows an audit trail of the resolution and comparison to the expected timelines. Fault times are checked by Operations Division Asset & Work to verify that fault statistics are correct.

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

Site	Procedures dealing with outages	Systems and Procedures monitoring performance
All	Yes	TCS System. Asset Management Reports issued monthly. Monitoring of planned interruptions > 4 or 6 hours however: <ul style="list-style-type: none"> ▶ No reporting of all interruptions (including planned and unplanned) over 4 or 6 hours.

Finding:

2. There was no direct reporting of the number of all interruptions, including both planned and unplanned, that were greater than 4 or 6 hours duration.

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 planned interruptions and provide alternative supply 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.

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

The "Job Planning - Work Parcel Form" is used to manage the planning of outages. The form identifies whether a customer outage is required, whether notifications will be required and if critical customers will be affected. A "Planned Outage Report" is available on the company network on Cognos Enterprise. Data can be queried from the system and entered into spreadsheet for analysis.

Outages are monitored through TCS for duration and, if in excess of 4 or 6 hours, are flagged in reports. The "Planned Outage Incident Outside Charter" spreadsheet manages the analysis of outages over 4 or 6 hours. The Asset management Report" provides a monthly summary of planned outages over 4 or 6 hours.

Sites have arrangements to provide alternative supply for extended outages. Mobile equipment is available throughout the network and can be deployed to provide alternative supplies where necessary.

The "Crisis and Emergency Management Plan" guides responses to critical interruptions. The plan allows the local and head office emergency response teams to mobilise alternate power generation.

Customer Services flag customers with special health needs (Special Needs or SN customers) in account records. The system relies on the customer notifying Horizon Power through a form. Once the customer is registered that information is provided to the districts through Community and Customer Relations Managers (CCRM). The "Retail" information is transferred to the Electricity Network Management and Control (ENMAC) System. Customer information is uploaded by Gentrac Velocity (the customer services application) into TCS on a nightly basis. Both SN customers and commercially sensitive loads are marked on the "HV Diagram", the online schematic display of the network, with online real time system status. Switching processes can then display SN customers and their connection status when outages are planned.

Summary

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

Site	Alternative Supply	Special Health Needs Customers
All	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 outage.

Planned outages are monitored for duration, details of planned outage duration exceeding the Code criteria are recorded in the "Planned Outage Incident Outside Charter" spreadsheet which is used to report on outages over 4 or 6 hours hours. Each of the incidents is categorised and causes identified. Those outages are reported in the "Asset Management Report".

The entire process of outage management notification is documented in the "Customer Services - Framework Process Map - Notification Of Planned Outages" (DMS#3724661_v1). Crew leaders (the Work Delivery Coordinators, WDC) provide advice of forthcoming work through a "Regional Planned Outage Notification" to both the CCRM and the Business Service Officer. Notification sheets record the details of notifications to customers, including customer details and the time of notification. Notifications are provided through letters, "Planned Power Interruption" cards, advertisement and phone calls. Customers not notified of planned outage receive a formal letter (DM#3490959) together

with a claim form for requesting compensation payment.

There is no separate reporting of outages having insufficient notification.

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 outage

Site	Notification ≥ 72 hours prior	Duration ≤ 4h or 6h (as practicable)
All	Controlled	Monitored 85 outages > 4 or 6 hours

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 interruption (duration over 12 hours or more than 16 interruptions in the preceding year) occurred and where the Licensee considers that the prescribed standard (9 years out of 10) is unlikely to be met.

Horizon Power employs the Cognos Express system to monitor interruptions and provide reports. Interruptions can be traced to the customers at the transformers so that both customer numbers and addresses can be identified.

Monitoring is performed through reporting in the monthly "Asset Management Reports", in the "Regulatory" Section. A brief analysis of trends is provided.

The "Network Quality and Reliability of Supply Performance Report 2012/13" shows that there were 60 interruptions over 12 hours in the districts. The number of customers experiencing interruptions over 12 hours has improved, from earlier trend of increases from 333 in 2009-10, to 1142 in 2010-11 and 1875 in 2011-12 to a decrease to 587 in the current audit period. The most common causes of interruptions were external, ranging from lightning to wind, wind borne debris and motor vehicle. Esperance and Port Hedland were the towns with the highest number of interruptions; for most interruptions only one premise was affected.

Horizon Power's Cognos Express system monitors the number of customers that experience more than 16 interruptions. A total of 3327 premises experienced more than 16 interruptions in the audit period. There has been no trend in the past periods, the numbers have varied from 2535 in 2009-10 to 819 and

1176 in following periods. There is a process for monitoring the frequency of interruptions through the reporting spreadsheet, the "AMR >16 Outages Detail Report" and in Asset Management Reports, identification of actions by Districts and nomination of corrective activities in the Asset Management Plan. Trends and causes are analysed by the Planning Group which has to ensure that the systems have sufficient capacity and reliability. The Planning Group works with the districts to identify and find solutions to the problems. Any actions are costed through the budgeting process and the Capital Works Program under the "Reliability Improvement Program" and the Capacity Improvement Program". However:

- ▶ there is no clear evidence that causes of excessive interruption frequency for the preceding period (2011 - 2012) have been systematically reviewed and remedied, or alternative arrangements made with customers in 2012 - 2013.

Summary

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

Site	2013 > 12 hours	9 Years out of 10 (≤ 12 hours)	Causes of Interruption Remedied / Alternative Arrangements
		Compliance	2013
All	60 interruptions and 587 premises affected	Not available	Causes are identified for interruptions > 12h

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

Site	2013 > 16#	9 Years out of 10 (≤16#)	2012 > 16#	Causes of Interruption Remedied / Alternative Arrangements
		Compliance		2012
All	3327 premises	Not available	1176 premises	No reporting on causes for frequency > 16 for the 2011 - 2012 period.

3. There is no clear evidence that causes of excessive interruption frequency (i.e. frequency > 16) for the preceding period (2011 - 2012) have been systematically identified, reviewed, reported and remedial action taken or alternative arrangements made in 2012 - 2013.

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 length of interruptions 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 identifies the length of interruption of supply to each customer of every town in outage minutes.

The overall four year average of 297 minutes for the four years up to 30 June 2013 is still higher than the required figure, however the overall trend has been downward since a peak of 329 minutes in 2011-12.

The average over the last four years, inclusive of 2013, was greater than 290 min in nine out of the 35 town sites.

Horizon Power also calculates the same data excluding major external events such as storms cyclones and floods, which are out of its control. The resulting data is defined as "Normalised Data" and corresponds to the network performance within Horizon Power's control. For the audit period the "Normalised" length of interruption of supply to customers in outage minutes over the four years was 202, well under the prescribed limit.

Summary

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

Site	2013 (≤ 290 m)	4 Year Average (Avg over 4 years ≤ 290 min)
	<i>(For information only)</i>	Figures have been calculated over 4 years up to 2013.
All sites	318	297
NWIS <i>(for information only)</i>	293	214

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 is in general compliance with the requirements of the Code, except as noted below.

There was one recommendation arising from the 2011 - 2012 audit. The audit found that the action is still open and has been included in this year findings:

- HP carries routine monitoring of power quality at substation busbars and not at customer connections, however monitoring does not include parameters required by the Code. Monitoring at customer connections is reactive and is carried out when there is a power quality complaint. No measurement of flicker, harmonics and individual harmonics, required under sections 6 and 7 of the Code, was carried out.

Two "Opportunity for Improvement" (OFI) had been raised in the previous audit. Both were closed.

In addition to the action still open from the previous audit, the audit made two new findings:

- there was no direct reporting of the number of all interruptions, including both planned and unplanned, that were greater than 4 or 6 hours duration;
- there is no clear evidence that causes of excessive interruption frequency (i.e. frequency > 16) for the preceding period (2011 - 2012) have been remedied or or alternative arrangements made in 2012 - 2013. Remedy would require systematic identification, reporting, review and rectification.

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 satisfactory (✓), unsatisfactory (✗), or as actions in progress, observations or opportunities for improvement.

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

Based on the scope of the audit defined in section 26 of the Code, Qualeng has found that 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

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 system monitoring compliance with the Code is in compliance with the Code requirements except for the observations noted below.	
Div 1, Sec. 5 - 7	Quality and Reliability standards: voltage fluctuations, harmonics.	✓	✓	The system monitored power quality complaints and no complaint was identified as due to quality of supply. ▶ 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. Initiate monitoring of compliance of power quality in respect of flicker and harmonics at customer connections (open from 2011 - 2012 period).
Div 1, Sec. 8	System to monitor compliance with duty to disconnect if damage may result due to power quality.	✓	✓	Responsibility to disconnect customers remains with the service crew.	
Div 2, Sec. 9	System to monitor compliance with maintaining the supply with a minimum number and duration of interruptions.	✓	✓	A response system is in place to attend to faults and interruptions and to address loss of supply. ▶ However there was no direct reporting of the number of all interruptions, including both planned and unplanned, that were greater than 4 or 6 hours duration.	2. There should be reporting of the number of all interruptions, including both planned and unplanned, that are greater than 4 or 6 hours duration.



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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 2, Sec. 10	System to monitor compliance with reduction of effects of interruptions or provision for alternative supplies for proposed interruptions.	✓	✓	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 and notifications for planned interruptions.	✓	✓	There is a formal system for notification of outages to customers. Outages lasting over 4 hours are reported and causes identified.	
Div 2, Sec. 12	System to monitor compliance with duty for remedial action where significant interruptions to small use customers (> 16 times or > 12 Hours).	✓	✓	There has been an increase in the number of interruptions greater than 12 hours in 2011-12 from the previous period. For each interruption the causes had been identified and rectified. Overall the main causes for the increase are extreme weather events.	
		✓	✓	<p>▶ There is no clear evidence that causes of excessive interruption frequency (i.e. frequency > 16) for the preceding period (2011 - 2012) have been remedied or or alternative arrangements made in 2012 - 2013. Remedy would require systematic identification, reporting, review and rectification.</p>	<p>3. Implement a system for monitoring compliance with the requirement to remedy the causes of frequency of interruptions in excess of Code requirements for the preceding audit period (in this case 2012 - 2013) or provide alternative arrangements with customers.</p>



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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 3, Sec. 13	System to monitor compliance with standards for the duration of interruption of supply in particular areas (\leq 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 297 min and still above the 290 min limit. Removal of major event days reduces the figure to 202 min which implies that significant weather events have affected Horizon Power's performance.	
Div. 4, Sec. 15	Systems to monitor compliance with provisions may be excluded or modified by agreement	✓	✓	Complies.	