



ABN 20 009 454 111

*Audit Report*  
Horizon Power  
2012 Network Quality and Reliability of Supply  
Performance Audit -  
Operation of Compliance Monitoring Systems

Telephone:  
Fax:  
E-Mail:  
Web:  
Postal Address:  
Office:

+61 8 9260 0003  
+61 8 9225 7447  
[projects@qualeng.net](mailto:projects@qualeng.net)  
[www.qualeng.net](http://www.qualeng.net)  
PO Box Z5261, St George's Terrace, PERTH WA 6831  
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 August 2012 Horizon Power commissioned Qualeng to carry out the audit in respect of the operation of such systems to cover the period 1 July 2011 to 30 June 2012.

The audit was conducted between August and September 2012 and included:

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

Horizon Power has a number of systems that monitor its performance in respect of the requirement of the Code. Horizon Power has procedures in place to respond and report on customer complaints and maintaining the quality of supply. The Trouble Call System (TCS) and Power Quality Investigations have been implemented to manage power quality issues and faults from a customer call to resolution.

A system is in place to manage and monitor planned interruptions. Alternative means of supply are available to mitigate interruptions. Customers with special health needs are identified within the system. Interruption data is recorded and monitored for duration and occurrences and the information is reported monthly and yearly.

There was one main findings in the audit:

- No records were available of flicker or harmonics measurements at customer connections. There is no systematic sampling of power quality at customer connections.


Two opportunities for improvement were noted:

- in respect of the need to improve the link between outages/incidents/power quality investigations and associated information and
- consideration of the causes leading to frequency of interruptions exceeding 16 times per year per customer.

Based on the scope of the audit defined in section 26 of the Code, and except for the finding 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".

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	20/09/2012

**Audit Team**

Audit Team	Description
M Zammit	Project Director and Lead Auditor

**Issue Status**

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1	20/09/2012	First issue	MZ

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# *1 Objectives and Scope of Audit*

## **1.1 INTRODUCTION**

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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 across 34 townships 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 and the North West Interconnected System (NWIS). 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 July 2012 Horizon Power commissioned Qualeng to carry out the Performance Audit to cover the period 1 July 2011 to 30 June 2012.

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

## **1.2 AUDIT OBJECTIVES**

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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**

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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 is under 6 hours, or under 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 be less than 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 2012.

On Horizon Power's behalf various representatives participated in the audit, contributed to sourcing the documentation and providing evidence to the audit. Staff interviewed were:

- Mr Gerard Chow, Business System Analyst, Operations Division Asset & Work
- Mr Clive Hunt, Business System Analyst,
- Mr Robert Kerrigan, Asset Strategy Engineer
- Ms Leah Lees, Compliance and Billing Support Coordinator

Mr Frank Buttigieg 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

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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

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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

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<b>Abbreviation</b>	<b>Description</b>
CAIDI	Customer Average Interruption Duration Index
ENMAC	Electricity Network Management and Control
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

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The previous quality and reliability of supply audit was completed in September 2011. 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 2011 AUDIT

The following table lists the recommendations made in the 2011 Audit and records progress with any actions.

Item No	Requirement	Findings – Process / Procedure / Evidence	Status
1	There were no recommendations made in the 2011 Audit.		
	<p>There was one Opportunity for Improvement:</p> <p><b>Issue:</b> There appears to be differences between number of interruptions reported in management reports (Eg. Electricity Delivery Report) and yearly NQRS report.</p> <p>1.1. <u>Opportunity for Improvement:</u> Verify consistency of figures (eg . SAIFI) reported in management reports (Eg. Electricity Delivery Report) and end of year NQRS report.</p>	<ul style="list-style-type: none"> <li>Differences are due to normalisation of results. Some of the reports "normalise" the data by removing the effects of major events as these are separate from the trends of daily operations and provide a better view of the operational performance.</li> </ul>	Completed

## 3 Key Findings

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

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The Licensee is required to comply with requirements for quality of supply at the point of connection to the customer, both in terms of voltage fluctuations and harmonic distortion and to disconnect the customer where there is a possibility of damage to the customer installation.

#### 3.1.1 Quality of Supply - System/Process

Horizon Power has systems in place to monitor its compliance with Quality of Supply (QoS) requirements. Systems are in place to manage faults and customer requests regarding power quality. There is no process for routine measurements of power quality in terms of flicker and harmonics at the customer end. Readings of power quality are taken at substation busbars.

- ▶ No records were available of flicker or harmonics measurements at customers connections. There is no systematic sampling of power quality at customer connections.

Complaints on power quality (PQ incidents) are received through Horizon Power's call centre and are entered in TCS (Trouble Call System) together with an assigned fault code. Sometimes power quality issues are identified by field staff and are entered into the system as faults. Both types of incidents are recorded as Power Quality Investigations (PQI), assigned to Works Delivery and can be fixed and the cause confirmed or subject to more in depth investigations by Technical Services. Customers are advised of the proceedings and conclusion of investigations.

In 2012 there were 20 PQIs, of these most were classified as voltage fluctuations and were fixed by the attending crew. Causes were mainly blown fuses, blown cables, bad connections. All PQIs had been closed except for 4 raised in June 2012 which were due to be closed outside of the audit period. There were no "quality" events confirmed during the audit period.

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 in investigations.

#### Disconnection if Quality of Supply may Lead to Damage

The field crews can disconnect the customer if they determines that the customer installation may be damaged due to supply quality.

### 3.1.2 Evidence of power quality issues and reports

Review of the operation of systems, processes and practices dealing with monitoring the quality of supply has shown the following gaps:

1. No records were available of review of flicker or harmonics measurements. There is no systematic sampling of power quality at customer connections.

## 3.2 SYSTEM TO MANAGE COMPLIANCE WITH PART 2, DIVISION 2, STANDARDS FOR INTERRUPTION OF SUPPLY

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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 is kept under 6 hours, or under 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)

Horizon Power has procedures for monitoring both planned and forced outages and maintaining the supply with a minimum number and duration of interruptions.

A form is in use to manage the planning of outages, the "Job Planning - Work Parcel Form" which identifies whether a customer outage is required, whether notifications will be required and if critical customers may 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.

The "Planned Outage Incident Outside Charter" spreadsheet manages the analysis of outages over 4 hours.

The monthly Asset Management Report also reports on duration and frequency of interruptions. The reports allow constant monitoring of interruption performance.

Site	Procedures dealing with outages	Procedures monitoring performance
All	Yes	Preplanning of outages AM reports issued monthly

### **3.2.2 Reduction of effects of interruptions and provision for alternative supplies for proposed interruptions (Sec. 10)**

Systems are available through TCS, through work preplanning and through Customer Services for monitoring the effect of interruptions and for the identification of customers.

The fault response procedure in TCS provides for appropriate responses to faults. Outages are monitored for duration and if in excess of four hours are flagged in reports. Fault management procedures include consideration of bypassing faults, thus securing alternative supplies or requesting alternative power generation.

Sites have arrangements to provide alternative supply for extended outages.

Customer Services flag customers with special health needs (Special Needs or SN customers) in account records and provide the information to the districts through Community and Customer Relations Managers (CCRM). Commercially sensitive loads are also identified. Both types of customers are displayed on the "HV Diagram", an online schematic of the network, so that their presence is clear to all operators and switching programs can be arranged to suit their requirements. Customer information is uploaded by Gentrac Velocity (the customer services application) into TCS on a nightly basis and can be displayed from the HV Diagram.

Site	Alternative Supply	Special Needs Customers
All	Yes	Identified

### **3.2.3 Planned interruptions (Sec. 11)**

As noted above, notifications are prompted and recorded in the "Job Planning - Work Parcel Form". Notifications of planned interruptions are usually managed through card drop, phone calls, fax, newspaper or radio. Notifications procedures include the requirement of three days customer advance warning.

As noted previously, the "Planned Outage Incident Outside Charter" spreadsheet is used to report on outages over 4 hours. Each of the incidents is categorised and causes identified. In total there were 60 instances of interruptions over 4 hours.

If the interruption is due to be longer than 4 hours sites deal directly with customers through the CCRM.

Site	Notification 72 hours prior	Duration < 4h (as practicable)
All	Controlled	60 outages > 4 hours

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

**Requirement:** For significant interruption (duration over 12 hours or more than 16 interruptions in the preceding year) where the licensee considers that the standard is unlikely to be met the licensee is required to remedy the causes of interruptions or make alternative arrangements.

Reporting systems (Cognos Express) are used to monitor "distinct" incidents affecting customers (identification of "distinct" incidents overcomes the issues of multiple power restorations which may impact on the statistics of interruptions). Customers are counted at transformers and the incidents can be traced back to the customer address.

The system provides reports for significant interruptions with duration over 12 hours.

The "Network Quality and Reliability of Supply Performance Report 2011/12" showed that there were interruptions greater than 12 hours at several sites and that for each interruption the causes had been identified. There were a number of significant weather events that impacted on the reliability performance. Largest contributors to interruptions were wind, wind borne debris and lightning. The discrete area with most interruptions over 12 hours was the NWIS.

Interruptions over 12 hours have increased from 333 in 2009-10, 1142 in 2010-11 to 1875 in the current audit period. There was no analysis of the overall reasons behind the increase in interruption severity, however causes to each individual interruption were provided and weather appeared to be the predominant factor.

There was no trend in the frequency of interruptions, ranging from 2535 to 819 and 1176 for the three periods noted above.

Site	2012 > 12 hours	9 Years out of 10 (< 12 hours)	2012 > 16#	9 Years out of 10 (<16#)	Causes of Interruption Remedied / Alternative Arrangements
		Compliance		Compliance	2012
All	1875	Not available	1176	Not available	Causes identified for interruptions > 12h No reporting on causes for frequency > 16

2. There is no capability in the present reporting system to identify the causes for excessive frequency of interruptions (i.e. frequency > 16).

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

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**Requirement:** The Code provides that the average length of interruptions for the four years up to the current year for areas other than the Perth CBD to be less than 160 minutes in urban areas and less than 290 minutes in any other area of the State.

Horizon Power routinely reports on the length of interruptions. As the figures available at the time of the audit were not verified, the numbers are reported below as a means to clarify the scale of issues and may not be accurate.

The overall four year average is still higher than the required figure, however there was no significant negative trend in the period. In about 12 sites the average length of interruptions was greater than 290 min. The average over the last four years, inclusive of 2012, was greater than 290 min in nine out of the 34 sites.

The NWIS endured severe weather events, including extremely hot weather and cyclones, however its performance was still acceptable.

Site	2012 ( < 290 m)	4 Year Average (Avg over 4 years ≤ 290 min)
	(For information only)	Figures have been calculated over 5 years up to 2012.
All sites	339	302
NWIS	261	169

## 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 the operation of the systems that are in place to monitor compliance with Part 2 of the Code is in general compliance with the requirements of the Code, except as noted below in the summary.

There were no recommendations arising from the previous audit. One "Opportunity for Improvement" has been addressed.

Table 1 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.



**Table 1: 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			Operation of the system monitoring compliance with the Code is in compliance with the Code requirements except for the observations noted below.	<b>1. (OFI)</b> 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.
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.	<b>2.</b> Start and monitor program of power quality measurements at customer connections.
				▶ No records were available of flicker or harmonics measurements at customer connections. There is no systematic sampling of power quality at customer connections.	
Div 1, Sec. 8	Duty to disconnect if damage may result due to power quality.	✓	✓	Responsibility to disconnect customers remains with the service crew.	
Div 2, Sec. 9	Maintain 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. Complies.	
Div 2, Sec. 10	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.	

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. 11	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	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.	3. (OFI) Consider analysis of the causes of frequency of interruptions.
				▶ There is no capability in the present reporting system to identify the causes for excessive frequency of interruptions (where frequency > 16).	
Div 3, Sec. 13	Standards for the duration of interruption of supply in particular areas (30, 160, 290 min)	✓	✓	Monthly reports monitor the duration of interruptions. Duration of interruption is relatively steady at 339 min and still above the 290 min limit. The average over four years is 302 min. Removal of major event days reduces the figure to 203 min for the audit period which implies that significant weather events have affected Horizon Power's performance.	
Part 4, Div. 3, Sec. 27	Publication of information about performance.	✓	✓	Complies with direction from Authority.	