BHP BILLITON IRON ORE
NEWMAN TOWNSHIP ELECTRICITY SUPPLY

ANNUAL AUDIT REPORT ON COMPLIANCE MONITORING SYSTEMS 2017/2018 FINANCIAL YEAR

REVISION B

7/09/2018

APD Job Number: W_APD05688

APD POWER ENGINEERING

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EXECUTIVE SUMMARY

The township of Newman is located approximately 1,200km to the north of Perth, within the Shire of East Pilbara. The electricity network is owned, governed and operated by BHP Billiton Iron Ore Supply Authority (BHPBIOSA). The network encompasses the township of Newman, the Airport, Capricorn Roadhouse, town water supply bore field and a few other connections in the adjacent areas.

In accordance with WA Electricity Industry Code 2005 (the Code), the electrical supply authorities must publish a report setting out the information described in Schedule 1 of the Code for each financial-year (FY). This document, known as the *Annual Audit Report*, is to provide the detailed report on the Network Quality & Reliability of Supply. The Code also requires the supply authority to arrange an independent audit and subsequent report on the procedures and systems that the distributor has in place for monitoring its compliance to the Code's Part 2. APD were engaged by BHPBIOSA as the independent consultant to undertake the audit process and prepare the report.

The audit interviews where undertaken on the 01st August 2018 at BHPBIOSA's Newman offices, with majority of relevant stakeholders and resources available to APD. As a result of the audit process and interviews, the following key observations were made:

- The introduction of industry experts in the previous 2016/17 FY for the purpose of improving in-house skillsets and capabilities in terms of primary plant maintenance and testing has shown a significant improvement in the reliability of the Newman Township network over the 2017/18 FY.
- From the previous 2016/17 FY, a shortage in the resources allocated to the inspection process was identified and during the 2017/18 FY an additional external resource was allocated to assist with the inspection process around the Newman Township.
- BHPBIOSA have continued to undergo changes to the structure of the division in the 2017/18 FY with the creation of a new role "Senior Operations Specialist" as well as the re-distribution of internal resources to provide a presence at the BHP Mining Area C Power Station.

The results for 2016/2017 audit are shown in the table titled 'Audit Scorecard' (presented in the overleaf). General improvement compared to last FY are noted, especially in the following areas:

- Engaging and external auditor to review and audit the 2016 Inspection System Plan.
- Consistently improving the utilization of the network controller role to monitor and control the network during outages, which in turn has assisted with timely restoration of the supply as well as improved outage records keeping, used to better identify the root-cause of the incidents occurred in the network.
- Continual focus toward maintaining and improving network reliability and supply quality through regular monitoring and targeted asset replacement program, based on the fault frequency and criticality as well as the failure mode.

The principal area in which BHPBIOSA can make improvement in the coming FYs are:

- Continuous PQ monitoring of the LV network to ensure compliant supply at the customer's point of connection (specially with increasing unbalanced loads); and

With respects to the holistic electrical network, the recent PQ metering data indicates that Newman's electrical network has undergone noteworthy improvements to maintain its reputation as a robust and inherently good network. The basic electrical parameters of voltage, frequency and voltage total harmonic distortion were consistently stable and well within compliance-levels.

The only exception was the individual Voltage Harmonic Distortions for the feeders supplied from Town Substation. The magnitude of the voltage's even harmonics (specifically the 6th, 12th and 24th

order) were found to occasionally exceed the limits set by AS 61000:2001, which in turn indicates the presence of unbalanced 3-phase loads with possible DC component in the network. Although this was previously observed in the 2016/17 FY, it is not considered a problem of major concern at the present time (as observed for <2% of the measurements). However, should it exacerbate in coming years, then mitigation measures may be required to ensure quality of supply.

Audit Scorecard		
Audit Description	**Audit Overall Rating**	
	2016/2017	**2017/2018**
The Electricity Industry Code 2005 Part 2 Division 1 – Quality Standards – Section 6 - **Voltage Fluctuations**		
The Electricity Industry Code 2005 Part 2 Division 1 – Quality Standards – Section 7 - **Harmonic Distortion**		
The Electricity Industry Code 2005 Part 2 Division 1 – Quality Standards – **Voltage Level**		
The Electricity Industry Code 2005 Part 2 Division 1 – Quality Standards – **Frequency**		
The Electricity Industry Code 2005 Part 2 Division 2 – Standards for the interruption of supply to individual customers – Section 9 – **General standard of reliability**		
The Electricity Industry Code 2005 Part 2 Division 2 – Standards for the interruption of supply to individual customers – Section 10 – **Duty to reduce effect of interruption**		
The Electricity Industry Code 2005 Part 2 Division 2 – Standards for the interruption of supply to individual customers – Section 11 – **Planned Interruptions**		
The Electricity Industry Code 2005 Part 2 Division 2 – Standards for the interruption of supply to individual customers – Section 12 – **Significant Interruptions to Small Customers**		
The Electricity Industry Code 2005 Part 2 Division 3 – Standards for the duration of interruption of supply in particular areas – Section 13 – **Standard for Other Areas (Newman Township system 290mins)**		

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1. INTRODUCTION

BHP Billiton Iron Ore (BHPBIO) is one of the world's major suppliers of iron ore and is based in the Pilbara region of Western Australia. The township of Newman is located approximately 1200km to the north of Perth, within the Shire of East Pilbara. It is the main town for the Mt Whaleback iron ore mine, Mining Area C and several smaller satellite mines.

The electricity network is owned, governed and operated by BHP Billiton Iron Ore Supply Authority (BHPBIOSA). The network encompasses the township of Newman, Newman Airport, Capricorn Roadhouse, town water supply bore field, Mt Whaleback iron ore mine and several smaller mine leases in the adjacent areas.

At present, the township of Newman has approximately 2,385 premises comprised of a mixture of residential and commercial customers.

In accordance with Western Australia Electricity Industry Code 2005 (the Code), the electrical supply authority must publish a report setting out the information described in Schedule 1 of the Code, in respect to each year ending on 30th of June. This document, known as the annual audit report, is to provide the full suite of information outlined in Schedule 1 of the Code, relating to the Network Quality and Reliability of Supply.

The Code is effectively written in four parts plus a reporting-requirements schedule; namely:

1. Part 1: Preliminary information associated with term of reference.
2. Part 2: Quality and reliability standards, which is further partitioned into 4 *divisions*.
3. Part 3: Payment to customers for lack of regulatory adherence.
4. Part 4: Incidental duties as a Supply Authority.
5. Schedule 1: Information to be published in this report.

As per the Code's Division 3 Section 26 Performance Reporting: BHPBIOSA as distributor is required to arrange an independent audit, and subsequent report, on the operation of the systems that the distributor has in place for monitoring its compliance to the Code's Part 2.

APD were engaged by BHPBIOSA to undertake the required audit and report on the current compliance monitoring processes and systems that BHPBIOSA have in place to ensure compliance with the Code.

2. SCOPE OF AUDIT

The scope of audit was limited to the review of the policies, guidelines, processes, systems and procedures that BHPBIOSA currently have in place to ensure that the network is complying with the following performance requirements specified in the Code:

- Part 2, Division 1 – Quality Standards, Section 6(2) – Voltage Fluctuations
- Part 2, Division 1 – Quality Standards, Section 7 – Harmonics
- Part 2, Division 1 – Quality Standards, Section 8 – Duty to disconnect if damage may result, Note (a) Voltage Levels Compliance
- Part 2, Division 1 – Quality Standards, Section 8 – Duty to disconnect if damage may result, Note (b) Frequency Levels Compliance
- Part 2, Division 1 – Quality Standards, Section 8 – Duty to disconnect if damage may result
- Part 2, Division 2 – Standards for the interruption of supply to individual customers, Section 9 – General standard of reliability
- Part 2, Division 2 – Standards for the interruption of supply to individual customers, Section 10 – Duty to reduce effect of interruption
- Part 2, Division 2 – Standards for the interruption of supply to individual customers, Section 11 – Planned interruptions
- Part 2, Division 2 – Standards for the interruption of supply to individual customers, Section 12 – Significant interruptions to small use customers
- Part 2, Division 3 – Standards for the interruption of supply to individual customers, Section 13 - Standards prescribed for particular areas.

The audit scope covered the electricity network supplying the gazetted township of Newman, Newman Airport and the town water supply bore field. The electricity network supplying the mining infrastructures at Mt Whaleback Iron mine and all other mine leases in the surrounding of the township of Newman were not required to form part of the audit.

Refer to Appendix A for the geographical map of the township of Newman.

3. AUDIT METHODOLOGY

3.1.Audit Flowchart

The methodology applied to perform the audit is as per the following flowchart:

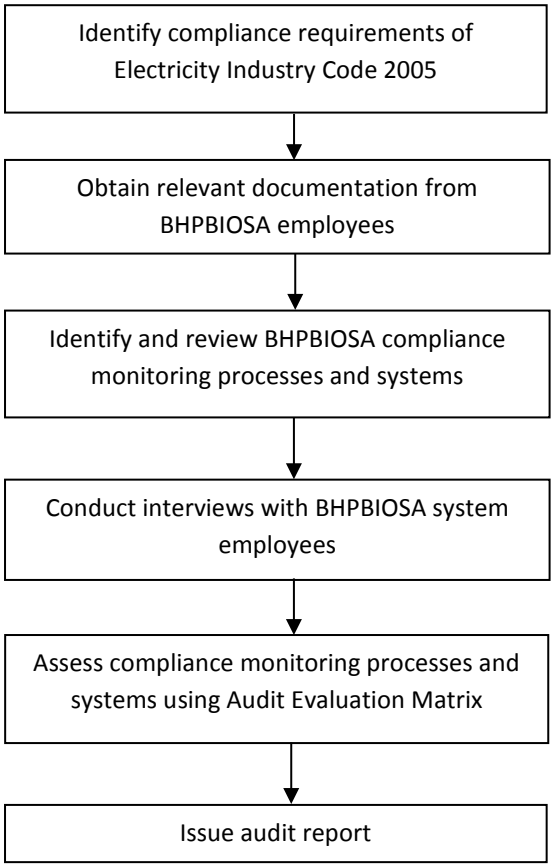


Figure 1 | Audit Methodology Flowchart

3.2.Audit Evaluation Matrix

The audit assessment was carried out as per the following procedures:

1. Review if BHPBIOSA have adequate systems, documented processes and guidelines, plans, and procedures in place to ensure compliance with each of the performance provisions defined in the Code. Assess the current monitoring processes and systems using the ten criteria shown in Table 1 below. Assign a performance ranking of Low, Medium, or High to each criterion.
2. Based on the ten performance rankings assigned, determine the overall compliance rating. The overall compliance rating indicates the effectiveness of the monitoring processes and systems in achieving compliance with each of the provisions.
3. Compare all overall compliance ratings with the preceding year's results. Improvements are measured in percentage. A 33% improvement means the overall rating has improved either from Low to Medium, or from Medium to High. An improvement from Low to High is equivalent to 66% of improvement. Table 2 shows the overall compliance rating criteria.

Table 1 | Audit of compliance management systems and processes evaluation matrix

Item		Description	Description of Ranking		
			Low	Medium	High
1	Process	Documented Process	Process in place documentation requires further development	Process is documented	Strong documentation and may comply with ISO9001
2		Process fully integrated with corporate management systems	Requires development	Linkage with management reporting	Full integration with corporate IT system
3		Demonstration of operator understanding of the documented process	Training required	Employee understanding	Strong employee understanding and evidence of training systems
4		Evidence that the process is followed, and records are kept as per process	Records available but not easily accessible or auditable	Adequate records available over full compliance periods	Auditable records available over full compliance periods with mandatory defined fields
5	Continuous Improvement	KPIs are in place	KPIs in place	KPIs are in place with some understanding by operators	Evidence that KPIs are in place and comprehensively understood by all operators
6		Reporting system supports continuous improvement	Requires development	Reporting systems exist at some levels	Reporting systems in place clearly showing gaps and trends of performance
7		Evidence action taken	Requires development	Evidence of reactive response	Evidence that gaps and trends are proactively actioned
8	Measurement Tools	Suitability of PQ measurement devices	PQ device has partial PQ functions and not fully compliant to AS61000.4.30	PQ device has full PQ functions but not fully compliant to AS61000.4.30	PQ device has full PQ functions and fully compliant to AS61000.4.30
9		Data collection methodology of the PQ measurement devices	Data manually extracted and analysed	Data extracted automatically over communications link. Data collection only.	Data extracted automatically over communications link with data analysis at the device.
10		Method of PQ measurement devices deployment	Portable devices not permanently fixed to the network.	Devices permanently installed on the network at strategic locations	Permanently fixed to the network and integrated into the network management control on a real time basis.
11		Overall Ranking	Refer to Table 2 for descriptions		

Table 2 | Overall Compliance Rating Definitions

Overall Compliance Rating	Description	
	High	Best practice quality processes and systems
	Medium – High	Above average quality processes and systems
	Medium	Adequate quality processes and systems
	Low – Medium	Quality systems and processes require further development.
	Low	Quality systems and processes require major further development

4. AUDIT RESULTS

The audit assessed the performance and suitability of the compliance monitoring systems and processes that BHPBIOSA have in place to ensure compliance with each of the provisions under The Code's Part 2 Divisions 1, 2 and 3.

4.1. Part 2, Division 1 – Quality Standards - Section 6(2), 7 & 8 (a)(b)

Sections 6(2), 7 and 8(a) (b) relate to flicker, harmonics, voltage magnitude and frequency respectfully.

The following notes relate to the Code's PQ compatibility levels:

- According to Section 6(2), the voltage fluctuation of electricity supplied must not exceed the compatibility levels of P_{st}=1.0 and P_{lt}=0.8 set out in Part 3.7 clause 3 of AS/NZS 61000:2001.
- According to Section 7, the standard for the harmonic voltage distortion levels of electricity supplied is a distortion level that is less than the compatibility levels set out in a table in the same section.
- In accordance with AS3000:2007, the voltage levels of the electrical network must be maintained at +10% and -6% of the supply voltage of 240V single-phase.
- According to Section 8, the frequency must be maintained at +/- 2.5% of 50 cycles per second.

Appropriate process and system are required to identify and record any breaches of the compatibility levels, and to keep track of the remedies undertaken to eliminate the breaches.

Table 33 (next page) shows the evaluation matrix for BHPBIOSA in relation to Part 2 Division 1 Section 6(2), 7 & 8 (a) (b) of the Code.

Table 3 | Part 2 Division 1 Section 6(2), 7 & 8 (a) (b) - Evaluation Matrix

Item	Category	Description	Ranking			% of Improvement Compared to the Preceding Year Results	Comments
			Low	Med	High		
1	Process	Processes in place and documented			✓	10%	Note 1
2		Process fully integrated with corporate management systems			✓	0%	No changes
3		Demonstrated operator understanding of the process			✓	0%	No changes
4		Evidence that the process is followed, and records are kept as per process			✓	10%	Note 2
5	Continuous Improvement	KPIs are in place		✓		0%	No changes
6		Reporting system supports continuous improvement		✓		0%	No changes
7		Evidence action taken - continuous improvement			✓	10%	Note 3
8	Measurement Tools	Suitability of PQ measurement devices			✓	0%	No changes
9		Data collection methodology of the PQ measurement devices		✓		0%	No changes
10		Method of PQ measurement devices deployment	✓			0%	No changes
11		Overall Ranking		MH			

Note 1 As noted from the previous FY16/17 audit and 2017/18 interviewees comments, continual improvement to the 2016 Inspection System Plan (ISP) has been undertaken. This improvement works consists of the following:

a. Content changes to the 2016 Inspection System Plan (ISP) due to the formal merge of the Department of Mines, Industry Regulation and Safety (DMIRS) and the former Building Commission and EnergySafety to form the new Building and Energy Division.

b. Adoption of Photo-Voltaic (PV) inspections into the 2016 Inspection System Plan (ISP) and ISP Manual Documents;

c. Undertaking an external audit of the 2016 Inspection System Plan; and

d. Review and implementation of recent changes to Regulation 55 of the Electricity (Licensing) Regulations 1991.

Note 2 BHPBIOSA continue to display improvements to the fault recording process, as evidenced through the employment of a second Network Controller to provide redundancy for the role and ensure a consistent fault record process. As a result of employing the second Network Controller, the availability and consistency of the outage information is further streamlined.

Note 3 As evident from interview discussions BHPBIOSA are proactively undertaking continuous improvement projects to increase the reliability and quality of supply to the Newman Township as well as the safety to public and personnel within the Township. This is evident from the numerous asset upgrade projects either already completed or currently in progress. This includes the following improvement works:

a. Replacement of two ageing 66/11kV Power Transformers at the Township Substation as well as the replacement of adjoining neutral earth resistors;

b. Proactive upgrade of an overhead section of low voltage powerline between poles 35/19 to 35/23 to an underground section to improve the safety to public within area due to lower height clearances on this section;

c. Budgeting and planning for the replacement of sections of high voltage overhead line with underground cabling within the Township of Newman, namely; an upcoming project for the upgrade of a main road overhead crossing to prevent oversize loads inadvertently connecting with the powerline.

d. Ongoing implementation of bird coverings, that is covering the cross arms to prevent birds nesting within the cross arms and subsequently prevent predatory birds from striking with the O/H lines when aggressing these nesting birds.

4.2. Part 2, Division 2 – Standards for the Interruption of Supply to Individual Customers, Section 9 & Section 10

Sections 9 and 10 relate to General Standard of Reliability; and Duty to Reduce Effect of Interruption respectively.

According to this provision, a transmitter or distributor must, *so far as is reasonably practicable*, ensure that the supply of electricity to a customer is maintained and the occurrence and duration of interruptions is kept to a minimum. According to this provision, it is not a breach of section 9 of the Code for BHPBIOSA to interrupt the supply of electricity to a customer for the purpose of maintaining or alter the network if the length of the interruption does not exceed 4 hours and BHPBIOSA have given notice of the proposed interruption to the customer not less than 72 hours before the start of the interruption. If it is not reasonably practicable to provide more than 72 hours of notice; notice should be given at the earliest practicable time before the start of interruption.

Table 44 shows the evaluation matrix for BHPBIOSA in relation to Part 2 Division 2 Section 9 & 10 of the Code.

Table 4 | Part 2 Division 2 Section 9 & 10 - Evaluation Matrix

Item	Category	Description	Ranking			% of Improvement Compared to the Preceding Year Results	Comments
			Low	Med	High		
1	Process	Processes in place and documented			✓	0%	Note 4
2		Process fully integrated with corporate management systems			✓	33%	Note 5
3		Demonstrated operator understanding of the process			✓	0%	No change
4		Evidence that the process is followed, and records are kept as per process			✓	0%	No change
5	Continuous Improvement	KPIs are in place			✓	0%	No change
6		Reporting system supports continuous improvement			✓	0%	No change
7		Evidence action taken - continuous improvement			✓	10%	Note 6 & Note 7
8		Overall Ranking		H			

Note 4 Where necessary, BHPBIOSA have the capability to deploy temporary diesel generation units to supply customers locally during the planned outage period. Note that no temporary generation was employed in FY17/18, largely due to the extensive N-1 capabilities of the Newman Township network, which where possible is given priority implementation over temporary generation units to ensure customers supply is maintained.

Note 5 As evident from the 2017/18 FY audit and interviewee discussions BHPBIOSA personnel thoroughly understand their obligation and responsibility to provide at minimum 72 hours' notice to customers before disconnection of supply for planned works. As evidenced through the employment of a visual management system (i.e., notification board) as well as SAP notifications. Interviewee discussions indicate that prior to an outage SAP records are investigated to ensure 72 hours' notice was provided and in the event 72 hours' notice has not been provided, the works are cancelled and re-scheduled.

Note 6 **BHPBIOSA continues to develop and improve upon internal relay test instructions (RTIs) – best practices documents. This document is designed to improve the quality assurance and reliability of the reporting and maintenance of protection relays and protection control schemes.** In addition to these RTIs, BHPBIOSA now performs all relay protection testing internally, this is because of investigations identifying that external contractors were not considering the relay protection design settings from protection grading studies, instead protection testing was undertaken based on the settings files from within the relays. As a result of this internal process several protection grading issues have been identified and rectified leading to large reliability improvements. This is partially evidenced through the reduced number of faults and outage times for the 2017/18 FY.

Note 7 BHPBIOSA have indicated a long-term plan to implement and utilise communications devices within the pad-mount substations (of which some have existing Talus T200 units installed) to assist with remote switching operations. The implementation of these devices could potentially enable operators to re-energise pad-mount substations remotely after faults thus reducing outage times.

4.3. Part 2, Division 2 – Standards for the interruption of supply to individual customers, Section 11; Section 12; and Division 3 Section 13

Sections 11, 12, and Division 3 Section 13 relate to Planned Interruptions, Significant Interruptions and Standards prescribed for particular areas respectively.

An appropriate system is required to record all the scheduled outages that BHPBIOSA plan to undertaken in each year. An efficient process should be in place for providing notifications to each of the customers that will be affected by planned interruptions in compliance with the provision.

Table 55 shows the evaluation matrix for BHPBIOSA in relation to Part 2 Division 2 Section 11, 12 & Division 3 Section 13 of the Code.

Table 5 | Part 2 Division 2 Section 11, 12 & Division 3 Section 13 - Evaluation Matrix

Item	Category	Description	Ranking			% of Improvement Compared to the Preceding Year Results	Comments
			Low	Med	High		
1	Process	Processes in place and documented			✓	33%	Note 4 & Note 8
2		Process fully integrated with corporate management systems			✓	33%	Note 4 & Note 9
3		Demonstrated operator understanding of the process			✓	0%	No change
4		Evidence that the process is followed, and records are kept as per process		✓		10%	Note 4 & Note 9
5	Continuous Improvement	KPIs are in place			✓	0%	No change
6		Reporting system supports continuous improvement			✓	0%	No change
7		Evidence action taken - continuous improvement			✓	0%	No change
8		Overall Ranking		MH			

Note 8 As evident by interviewee discussions, BHPBIOSA provide notification of planned outages within the following timeframes:

- General customers - 72hrs notice in advance; and
- Life support customers - 168hrs in advance.

Note 9 As evident by interviewee discussions, BHPBIOSA have a weekly reporting process in place where an automated report is generated to flag and capture planning activities that are not closed out within their designated week.

4.4. Audit Observations

The following observations were made throughout the audit process:

1. The BHPBIOSA employees that are involved in managing power quality understand the need to:
    - Ensure compliance with The Code's requirements;
    - Expeditiously rectify network disturbances that affect the quality of supply to customers; and
    - Extend the monitoring capability of the LV network.
2. The BHPBIOSA employees demonstrated a clear understanding of their roles and responsibilities in maintaining supply reliability and minimising the duration and frequency of interruptions to the customers.
3. The BHPBIOSA employees demonstrated a clear understanding of the systems and processes involved in managing planned and unplanned outages.
4. The BHPBIOSA operations team demonstrated sound understanding of the potential interferences that affect the power supply quality of the network, evident from discussions with BHP employees regarding the changeover of three phase air-conditioning units to single phase units and the potential harmonic and load balance issues expected.
5. Relevant BHPBIOSA interviewees demonstrated a concise understanding of their responsibilities under Part 2 Division 2 Section 12 of the Electricity Code to remedy the causes of interruptions to small use customers or enter into alternative arrangements if the supply has been interrupted for more than 12 hours continuously, or more than the permitted number of times.
6. BHPBIOSA currently supply two customers with special health needs who rely on electricity for life support and are aware of their responsibilities to that so far as reasonably practical, these houses are supplied with power.
7. BHPBIOSA have demonstrated a clear understanding of their responsibility to provide the residents of the Newman Township with a reliable network and service. As such BHPBIOSA are in the process of migrating from their current retailing and billing contractor (Agility) to Horizon Power, with one of the key driving factors behind the migration being the installation of Advanced Metering Infrastructure (AMI). These AMI smart meters are capable of two-way communication which in-turn will provide a number of benefits including:
    - Improved accuracy of meter readings – reducing estimated billing errors;
    - Early detection of power quality issues; and
    - Improved monitoring of power outages to assist maintenance crews in reducing restoration times.

    Similar to current billing contractor (Agility), Complaints made through Horizon Power will be filtered through to BHPBIOSA as required. The number of power quality related complaints was nil which corresponds with the observed physical quality of the network supply.
8. The continual improvement of the Network Controller role, including the introduction of a second Network Controller in the previous financial year has been successful with the role acting as a central point to record, monitor and control the network and outages. Further utilizing the network controller in this manner has created a centralized system for outage information, as such the availability and consistency of the outage information is further streamlined. In term of root cause analysis this enables systemic issues to be identified more succinctly.

9. BHPBIOSA employees are conscious of network performance and appear to take an active and responsible stance to underperforming assets, including:
    - Replacement of ageing and defective primary equipment, i.e., Township Substation Power Transformers and Neutral Earth Resistors;
    - Continuation of a preventative program to reduce the number of wildlife related outages (bird strikes). This preventative program includes applying bird coverings on the O/H lines where possible, as well as interaction with project teams to improve the design specifications of O/H poles, i.e., implementing covers on the cross arms to prevent birds nesting within the cross arms and subsequently prevent predatory birds from striking with the O/H lines when aggressing these nesting birds; and
    - BHPBIOSA has continued the process of replacing ageing or defective pole top transformers; the implementation of this process is supported through standardised preferred distribution transformer rating and supplier.
10. As evident by interviewee's discussions, BHPBIOSA have portable standby generators in place to cater for extended planned or unplanned interruptions. However, no temporary generation was deployed for the financial year ending June 2018. This is largely due to the extensive N-1 capabilities of the Newman Township network.
11. The following feedback was conveyed through the audit process:
    - As evident from the 2016/17 FY audit, BHPBIOSA was in the process of employing more utilities-based personnel into the team to improve in-house skillsets and capabilities in terms of relay testing (protection systems) and primary plant testing. During the 2017/18 FY audit interviews, positive feedback was conveyed regarding the utilisation of the internal resources for performing protection relay testing as this has significantly improved protection grading and subsequently network reliability;
    - From the previous 2016/17 FY, a shortage in the resources allocated to the inspection process was identified and during the 2017/18 FY an additional external resource was allocated to assist with the inspection process around the Newman Township. From discussions there is the potential for a third inspection resource to assist with undertaking the historical inspection works.
    - BHPBIOSA have continued to undergo changes to the structure of the division in the 2017/18 FY with the creation of a new role "Senior Operations Specialist". This role was created to support the Operations Supervisor in their day-to-day works enabling the Operations Supervisor to provide more focus toward direction the Operations Team.
    - In addition to the creation of a new role, BHPBIOSA have recently taken ownership of the BHP Mining Area C (MAC) Power Station. Hence, to provide an on-site presence BHPBIOSA have made the "Transmission Supervisor" role redundant and re-distributed personnel to the MAC Power Station and other internal roles.

5. CONCLUSIONS & RECOMMENDATIONS

The audit interviews where undertaken on the 01st August 2018 at BHPBIOSA's Newman offices, with majority of relevant stakeholders and resources available to APD for the audit process. It was noted by several interviewees that positive change within the business had occurred since the previous reporting period.

Within the 2017/18 reporting period BHPBIOSA continued to undergro significant changes and restructures to the division. The most notable changes being the creation of a new role "Senior Operations Specialist". This role was created to support the Operations Supervisor in their day-to-day works enabling the Operations Supervisor to provide more focus toward direction the Operations Team.

In addition to the creation of a new role, BHPBIOSA have recently taken ownership of the BHP Mining Area C (MAC) Power Station. Hence, to provide an on-site presence BHPBIOSA have made the "Transmission Supervisor" role redundant and re-distributed personnel to the MAC Power Station and other internal roles.

BHPBIOSA continue to demonstrate a pro-active response to improving the reliability of Newman's electrical network. The positive response is evident from the strategic replacement of underperforming equipment as well as installation of assets to improve network capacity and reliability, for example:

- Replacement of two ageing 66/11kV Power Transformers at the Township Substation as well as the replacement of adjoining neutral earth resistors;
- Proactive upgrade of an overhead section of low voltage powerline between poles 35/19 to 35/23 to an underground section to improve the safety to public within area due to lower height clearances on this section;
- Budgeting and planning for the replacement of sections of high voltage overhead line with underground cabling within the Township of Newman, namely; an upcoming project for the upgrade of a main road overhead crossing to prevent oversize loads inadvertently connecting with the powerline.
- Ongoing implementation of bird coverings, that is covering the cross arms to prevent birds nesting within the cross arms and subsequently prevent predatory birds from striking with the O/H lines when aggressing these nesting birds.

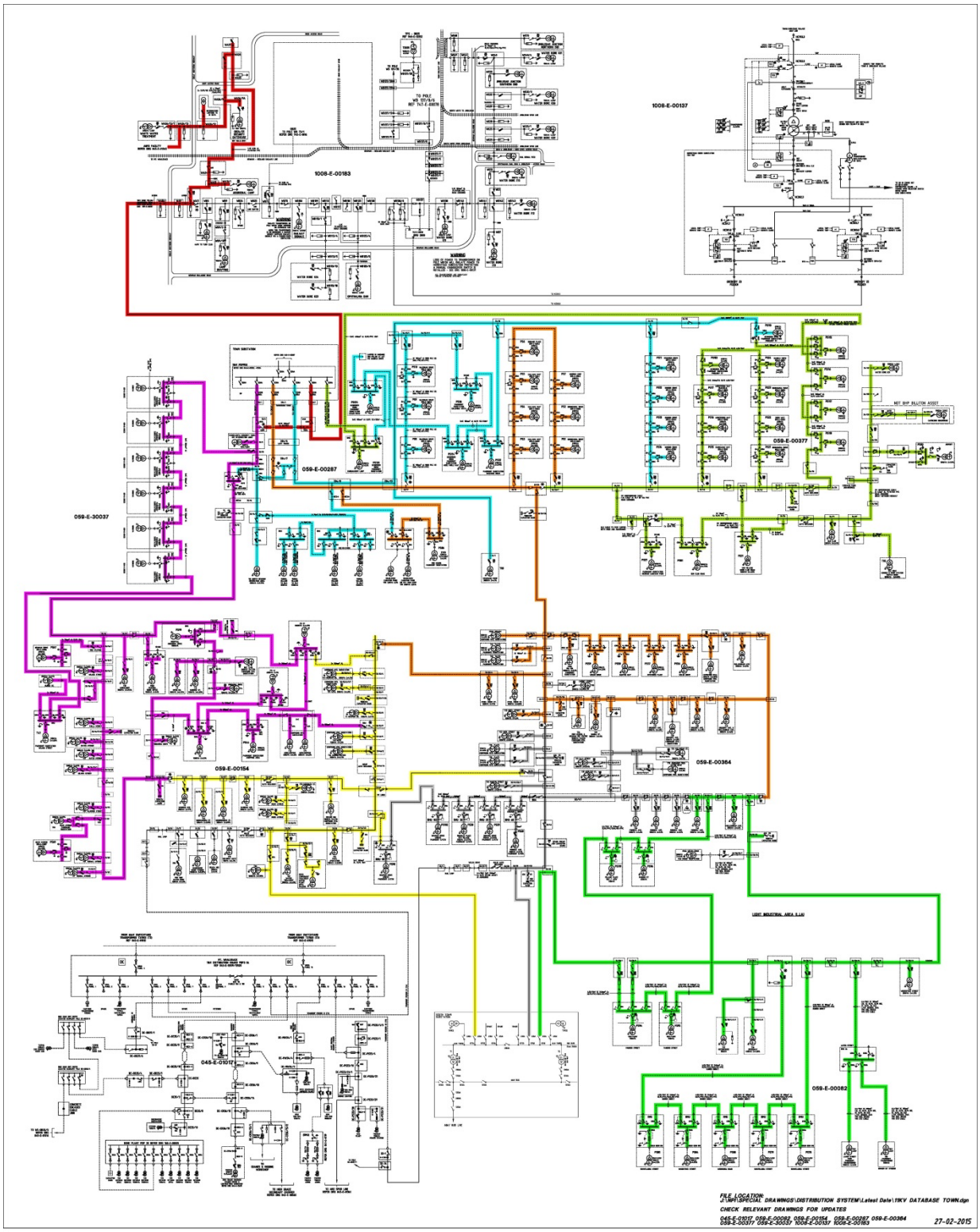
With respects to the holistic electrical network, the recent PQ metering data indicates that Newman's electrical network has undergone noteworthy improvements to maintain its reputation as a robust and inherently good network. The basic electrical parameters of voltage, frequency and voltage total harmonic distortion were consistently stable and well within compliance-levels.

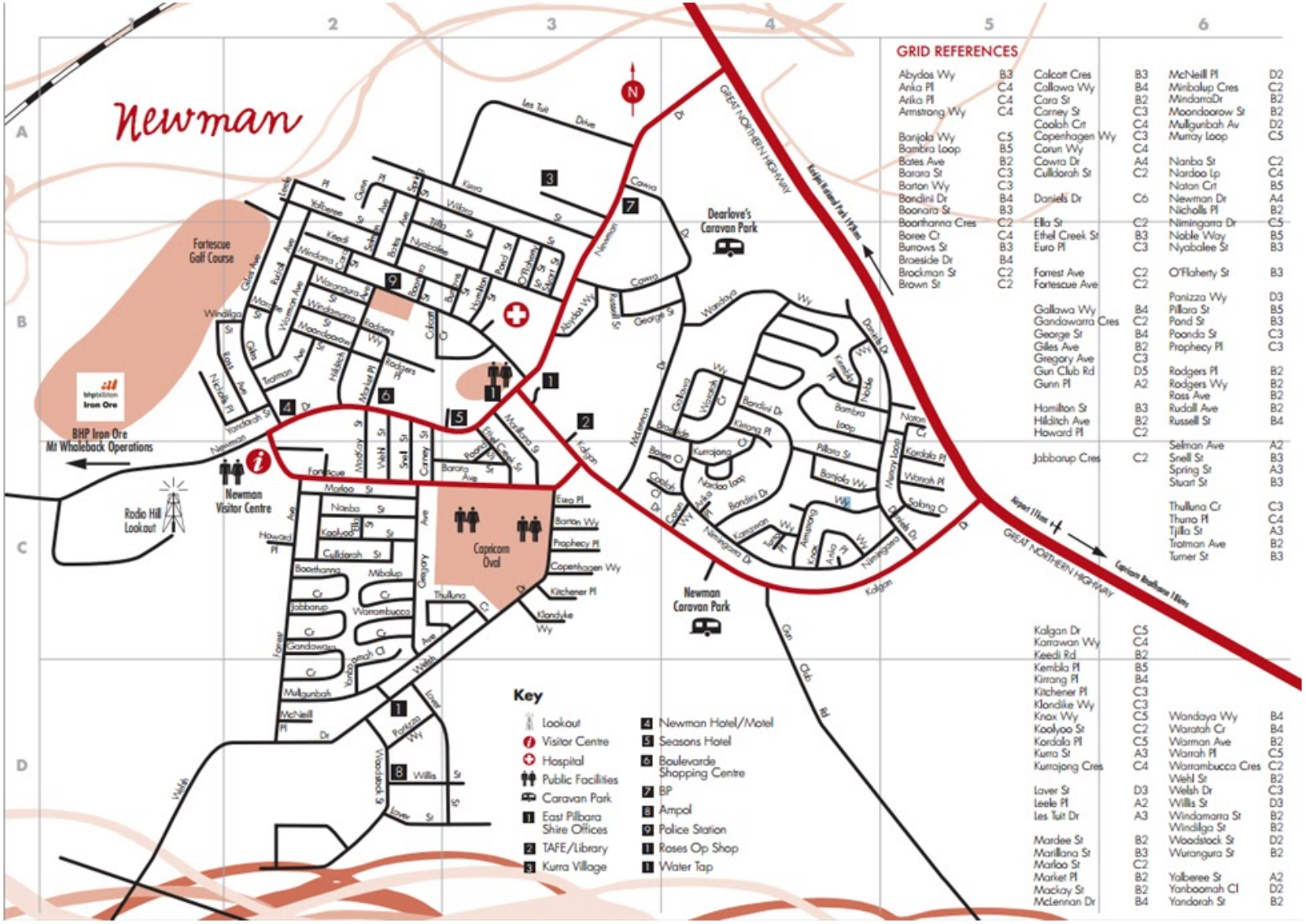
The only exception was the individual Voltage Harmonic Distortions for the feeders supplied from Town Substation. The magnitude of the voltage's even harmonics (specifically the 6th, 12th and 24th order) were found to occasionally exceed the limits set by AS 61000:2001, which in turn indicates the presence of unbalanced 3-phase loads with possible DC component in the network. Although this was previously observed in the 2016/17 FY this is not considered a problem of major concern at the present time (as observed for <2% of the measurements). However, should it exacerbate in coming years, then mitigation measures may be required to ensure quality of supply.

The main area where BHPBIOSA can continue to develop further:

- Further investigation and advancement toward implementing permanent PQ monitoring of the LV network in order to ensure compliant supply at the customer's point of connection as per Part 2 Section 5 of the Electricity Code.

APPENDIX A NEWMAN TOWNSHIP (SLD & MAP)




Newman
Fortescue Golf Course
BHP Iron Ore Mt Whaleback Operations
Radio Hill Lookout
Newman Visitor Centre
Capricorn Oval
Dearlove's Caravan Park
Newman Caravan Park
GREAT NORTHERN HIGHWAY
Les Tuit Drive
Gun Club Rd
Key
Lookout
Visitor Centre
Hospital
Public Facilities
Caravan Park
East Pilbara Shire Offices
TAFE/Library
Kurra Village
Newman Hotel/Motel
Seasons Hotel
Boulevarde Shopping Centre
BP
Ampol
Police Station
Roses Op Shop
Water Tap
GRID REFERENCES
Abydos Wy B3
Anka Pl C4
Arika Pl C4
Armstrong Wy C4
Banjola Wy C5
Bambra Loop B5
Bates Ave B2
Barara St C3
Barton Wy C3
Bondini Dr B4
Boonara St B3
Boorthanna Cres C2
Boree Cr C4
Burrows St B3
Braeside Dr B4
Brockman St C2
Brown St C2
Calcott Cres B3
Callawa Wy B4
Cara St B2
Carney St C3
Coolah Crt C4
Copenhagen Wy C3
Corun Wy C4
Cowra Dr A4
Culldarah St C2
Daniels Dr C6
Ella St C2
Ethel Creek St B3
Euro Pl C3
Forrest Ave C2
Fortescue Ave C2
Gallawa Wy B4
Gandawarra Cres C2
George St B4
Giles Ave B2
Gregory Ave C3
Gun Club Rd D5
Gunn Pl A2
Hamilton St B3
Hilditch Ave B2
Howard Pl C2
Jabbarup Cres C2
Kalgan Dr C5
Karrawan Wy C4
Keedi Rd B2
Kembla Pl B5
Kirrang Pl B4
Kitchener Pl C3
Klondike Wy C3
Knox Wy C5
Koolyoo St C2
Kordala Pl C5
Kurra St A3
Kurrajong Cres C4
Laver St D3
Leele Pl A2
Les Tuit Dr A3
Mardee St B2
Marillana St B3
Marloo St C2
Market Pl B2
Mackay St B2
McLennan Dr B4
McNeill Pl D2
Minbalup Cres C2
MindarraDr B2
Moondoorow St B2
Mullgunbah Av D2
Murray Loop C5
Nanba St C2
Nardoo Lp C4
Natan Crt B5
Newman Dr A4
Nicholls Pl B2
Nimingarra Dr C5
Noble Way B5
Nyabalee St B3
O'Flaherty St B3
Panizza Wy D3
Pillara St B5
Pond St B3
Poanda St C3
Prophecy Pl C3
Rodgers Pl B2
Rodgers Wy B2
Ross Ave B2
Rudall Ave B2
Russell St B4
Selman Ave A2
Snell St B3
Spring St A3
Stuart St B3
Thulluna Cr C3
Thurro Pl C4
Tjilla St A3
Trotman Ave B2
Turner St B3
Wandaya Wy B4
Waratah Cr B4
Warman Ave B2
Warrah Pl C5
Warrambucca Cres C2
Wehl St B2
Welsh Dr C3
Willis St D3
Windamarra St B2
Windilga St B2
Woodstock St D2
Wurangura St B2
Yalberee St A2
Yanboomah Cl D2
Yandarah St B2