

The Asset Partnership

*Ord Hydro
Asset
Management
System Review
2014
AMS Review
Report*

*Strictly Private and
Confidential*

September 2014

pwc



Darren Sexton
Pacific Hydro Pty Ltd
Executive Manager Operations, Australia
Level 11, 474 Flinders Street
Melbourne
Victoria
3000
Australia

25 September 2014

Dear Darren

Subject: Ord Hydro asset management system review report 2014

With the Economic Regulation Authority's (the **Authority**) approval, PricewaterhouseCoopers' The Asset Partnership (**PwC**) has prepared Ord Hydro's Asset Management System (AMS) review report for the review period from 1st July 2011 to 30th June 2014 to satisfy Ord Hydro's reporting requirements as per Section 14 of the Act and Section 20.4 of its Electricity Integrated Regional Licence (EIRL4) Versions 3 and 4 (**Licence**).

This review report has been prepared in accordance with the requirements of the April 2014 issue of the *Audit and Review Guidelines: Electricity and Gas Licences* (**Audit Guidelines**).

You are requested to review the findings of this report and present it to the Authority for approval.

Should you have any queries regarding this matter please contact me on 0419 275 548.

Yours Sincerely,

A handwritten signature in black ink, appearing to read 'Phil Clarke', written in a cursive style.

Phil Clarke
phil.clarke@au.pwc.com
T: (61) 02 8266 0036
M: (61) 0419275548
F: (61) 02 8286 0036



About PwC

PricewaterhouseCoopers (PwC) is one of the world's pre-eminent professional services organisations. PwC provides tax, audit, consulting, and financial advisory services to public and private clients. PwC helps its clients solve complex business problems and aim to enhance their ability to build value, manage risk, and improve performance. We are a network of firms in 157 countries with more than 184,000 people who are committed to delivering quality in assurance, consulting, tax, and advisory services.

Our commitment to delivering high-quality assurance services is at the heart of what we do. We provide comprehensive audit and assurance services designed to deliver real value and underpin investor confidence. Our professionals are dedicated to strengthening corporate responsibility, building public trust, and making positive impact in their communities.

PwC is the brand under which the member firms of PricewaterhouseCoopers International Limited (PwCIL) operate and provide professional services. Together, these firms form the PwC network. 'PwC' is often used to refer either to individual firms within the PwC network or to several or all of them collectively. Please see www.pwc.com/structure for further details.

About PwC Australia

In Australia, our assurance and consulting groups provides assurance on clients' asset management system performance and its effectiveness. We help our clients improve their external financial reporting and adapt to new regulatory requirements, including Sarbanes-Oxley and International Financial Reporting Standards.

We're the world's leading assurance and consulting firm; our audit clients include almost half of the FTSE 100 and Fortune 500 and many of the top ASX listed companies. We provide assurance and consulting services to thousands of small and mid-sized businesses.

Our people are energetic and inspirational and come from a diverse range of academic backgrounds, including arts, business, accounting, tax, economics, engineering, finance, health and law. From improving the structure of the Australian health system, to performing due diligence on some of Australia's largest deals, and working side-by-side with entrepreneurs and high-net-worth individuals, our teams bring a unique combination of knowledge and passion to address the challenges and opportunities that face our community. For more information, please visit PwC website at www.pwc.com.au.

Liability limited by a scheme approved under Professional Standards Legislation.

Executive summary

Introduction and background

Under section 14 of the Electricity Industry Act 2004 (WA) and as a condition of its current Electricity Integrated Regional Licence (EIRL4) version 4, Pacific Hydro appointed PricewaterhouseCoopers' The Asset Partnership (**PwC**) to conduct an independent assessment of its Asset Management System (AMS) effectiveness. The primary purpose of this review is to ensure Ord Hydro's AMS demonstrate compliance with the AMS requirements of the licence.

The Ord Hydro, operating under the management of Pacific Hydro, operates a 30 MW hydroelectric power station located at Lake Argyle in the Kimberley Region of Western Australia. Through its transmission network, Ord Hydro supplies power to two primary customers; Argyle Diamond Mine and Horizon Power. Horizon Power then distributes and retails power to the township of Kununurra.

The previous review, dated 14 October 2011, resulted in a twelve month extension to the standard two yearly requirement for such reviews. There have been no major changes to the business since the previous review.

Following approval by the Economic Regulation Authority (the **Authority**) on May 14, 2014 to conduct the asset management system review, PwC developed a review plan in accordance with the Audit and Review Guidelines. This plan, which was approved by the Authority on June 26, 2014, was carried out in accordance with the Audit and Review Guidelines.

Observations

In considering Pacific Hydro's internal procedures, structure, and environment, its compliance culture and its information system specifically relevant to the performance of its AMS subject to review, we observed that Pacific Hydro has:

- Maintained procedures and controls designed to meet its obligations relating to its customers' Power Purchase Agreements (**PPA**);
- Computerised maintenance management systems (MEX and WTG) are used for recording and managing planned and unplanned outages;
- Capital projects register and risk registers are maintained for managing asset financial planning and capital expenditure planning;
- Allocated responsibilities to specific managers and staff for meeting key requirements; and
- Recognised a number of elements of improvements from the previous review and implemented associated actions.
- Ord Hydro has confirmed that except upgrading new revenue meters, no major changes/modifications to the assets have been undertaken.

Findings

Table 1 below summarises the assessments made by the review on Pacific Hydro’s effectiveness of asset management system. On a scale of 1 to 4, “1” meeting or exceeding the required levels of performance with the rating scale moving down through lower levels where process is not performed or poor performance to “4”. (Adequacy of controls and Compliance ratings definitions are in accordance with the Audit Guidelines: Electricity and Gas Licences April 2014¹ definitions. These are also provided Section 3.3).

Asset management system component and effectiveness criteria	Asset management system effectiveness summary									
	Refer to review plan	No activity during review period	Asset management process and policy definition adequacy rating				Asset management performance rating			
Review priority	NA	Not rated	A	B	C	D	1	2	3	4
1	-	-	-	2	-	-	-	1	1	-
2	-	-	11	6	-	-	6	10	1	-
3	-	-	1	2	-	-	1	1	1	-
4	-	-	16	12	1	-	10	15	4	-
5	-	-	4	1	-	-	3	2	-	-
NA	-	-	-	-	-	-	-	-	-	-
Total	-	-	32	23	1	-	20	29	7	-

Table 1 Summary of system effectiveness

Pacific Hydro’s response to previous review recommendations

Our assessment of Pacific Hydro’s progress in implementing recommended action during the previous review is summarised below and detailed at section 7 of this report.

AMS Review period	Completed ¹	Closed out ²	In progress	Outstanding
2008 – 2011	6	1	0	0

1. Corrective action has been taken, 2. Recommendation was closed with no action.

Table 2 Status of 2011 AMS review action plan

It is PwC’s opinion that the recommended actions have been responded to in the appropriate manner in-line with the intentions of the previous auditor. It is recommend that Pacific Hydro action item ref 1.3 and complete the closed out item.

¹ Audit and Review Guidelines: Electricity and Gas Licences, April 2014

Recommendations and action plan

Table 3 is a summary of all the recommendations and action plans arising from this review.

Asset management system component	Review priority	Adequacy and Performance rating	Issue	Recommendation	Post review action plan
1.4 Non asset options (eg demand management) are considered.	4	C 3	The asset management system does not specify requirements to assess non-asset solutions.	Complete the closed out item 1.3 from the previous (2008-2011) asset management review recommendations.	Identify any existing or develop new procedure and include in the asset management system.
1.8 Likelihood and consequences of asset failure are predicted.	1	B 3	FMECA has been included in the AMS. However, no formal study has been undertaken so far.	Undertake FMECA studies to identify failures modes of critical assets and the consequences of failures. Keep the results updated as change occurs within operational, engineering, and regulatory requirements. Develop a plan to mitigate identified failures associated with critical assets.	Update asset management plan to include findings of the FMECA exercises.
3.2 The reasons for under-utilisation or poor performance are critically examined and corrective action or disposal undertaken.	4	B 3	Operational Performance Review process covers the utilisation and reliability of the assets. However, the reasons for poor performance and underutilisation are not critically examined to dispose those assets.	Develop an asset disposal process including various alternative options assessment. Utilise Operational Performance Review process for disposal decision making. Update asset management system and capital expenditure planning process accordingly.	Update asset management plan to include and utilise asset disposal process based upon the underutilisation and poor performance of assets.
3.3 Disposal alternatives are evaluated.	3	B 3	AMS requires that alternatives to be considered before disposal however, no significant asset disposal has taken place within the review period.	Develop an asset disposal evaluation process including alternative options. Identify opportunities for asset disposals as per the process.	Include disposal alternative evaluation process to the asset management plan.

Asset management system component	Review priority	Adequacy and Performance rating	Issue	Recommendation	Post review action plan
5.2 Risk management is applied to prioritise operational tasks.	4	B 3	Risk assessments are carried out prior to undertaking operational tasks. However, the outcomes of those assessments are not used as a tool to prioritise the tasks.	Develop a risk based operations prioritisation process to ensure the safety of the assets, people, and environment and update asset management system and operations management system / manuals accordingly.	Undertake operations task analysis and assign task priorities into the task management system. Make operating staff aware of changes and provide necessary training if required.
6.5 Risk management is applied to prioritise maintenance tasks.	4	B 3	Risk assessments are carried out prior to undertaking a maintenance tasks. However, those tasks are not formally prioritised in the CMMS based upon the criticality and the outcomes of the risk assessment.	Develop a risk based maintenance and inspection plans to prioritise maintenance tasks. Update asset management system and MEX and WTG maintenance management system accordingly.	Undertake maintenance task analysis and assign task priorities into the MEX and WTG. Make maintenance staff aware of changes and provide necessary training if required.
7.4 Physical security access controls appear adequate	4	A 1	It was noted during site visits that external "Warning - High Voltage" signage around the power station and switch yard was in poor condition and warnings were illegible.	Replace high Voltage warning signage around the power station and switch yard sites to ensure it complies with standards.	Include regular inspections of power station and switch yard statutory warning signage in site maintenance plans.
9.1 Contingency plans are documented, understood and tested to confirm their operability and to cover higher risks.	2	B 3	About five (5) contingency plans have been prepared and included in the AMS. However, testing of the plans has not been carried out.	Conduct a thorough risk assessment and identify opportunities to develop more disaster contingency plans and test those plans on a regular basis.	Develop new disaster recovery contingency plans and update risk register. Keep records of regular testing.

Table 3 Summary of recommendations and action plan

Basis for Qualified Conclusion

The review identified inadequacies for Asset Management Systems components 1.4, 1.8, 3.2, 3.3, 5.2, 6.5, 7.4, and 9.1 as described in our “Summary of Findings” section 4.

Conclusion

Based on our review, which is not an audit, except for the matters noted in the Basis for Qualified Conclusion section above, nothing has come to our attention that causes us to believe that Pacific Hydro has not complied, in all material respects in accordance with the asset management conditions of its Electricity Integrated Regional Licence EIRL4 versions 3 and 4 as measured by the licence conditions within the Authority’s *Audit and Review Guidelines: Electricity and Gas Licences*, April 2014, for the period 1 July 2011 to 30 June 2014.

Table of contents

1. Independent Assurance Report to Management	10
1.1. Pacific Hydro's responsibility	10
1.2. Our responsibility	10
1.3. Use of Report	10
1.4. Inherent limitations	10
1.5. Independence	11
1.6. Basis for Qualified Conclusion	11
1.7. Conclusion	11
2. Definitions	12
3. Scope of the review	13
3.1. Review objectives	13
3.2. Approach	13
3.3. Review methodology	14
3.4. Review participants	15
4. Summary of findings	16
5. Detailed observations	20
6. Recommendations	35
7. Actions from the previous review	36
7.1. Pacific Hydro's arrangement for monitoring progress	36
7.2. Summary of post review implementation plan progress	36
8. Changes to the Licence	38
Appendix A. - Appendices	39
A.1. Post review implementation plan	40
A.2. Review plan	42

1. *Independent Assurance Report to Management*

With the Economic Regulation Authority's (the **Authority**) approval, PwC was engaged to conduct a independent limited assurance engagement of Pacific Hydro's Asset Management System (AMS) effectiveness and compliance with the conditions of its Electricity Integrated Regional Licence EIRL4 versions 3 and 4 (**Licence**) for the period 1 July 2011 to 30 June 2014 (the "Period"). The criteria against which we assessed the compliance with the conditions of the License were derived from the Electricity Compliance Reporting Manual dated May 2011 and 2014.

1.1. *Pacific Hydro's responsibility*

Pacific Hydro is responsible for:

- Designing and implementing policies, procedures, and controls, which are designed to ensure appropriate level of AMS performance; and
- Implementing processes for assessing its compliance requirements and for reporting its level of compliance to the Authority.

1.2. *Our responsibility*

Our responsibility is to express a conclusion based on our limited assurance procedures, on whether anything has come to our attention to indicate that the Pacific Hydro Asset Management System has not complied, in all material respects, with the conditions of the License with respect to the Asset Management System for the Period.

Our review has been conducted in accordance with the Australian Standard on Assurance Engagements (ASAE 3000) "Assurance Engagements Other Than Audits or Reviews of Historical Financial Information" and April 2014 issue of the *Audit and Review Guidelines: Electricity and Gas Licences (Audit Guidelines)*. The work performed was designed to enable us to express the conclusion below. Accordingly, we have conducted such tests and procedures as we considered appropriate. Our procedures were set out in the Audit Plan reviewed and agreed with the Authority on June 26, 2014 and set out in Appendix 3.

A limited assurance engagement is substantially less in scope than a reasonable assurance engagement under ASAE 3000. Consequently, the nature, timing and extent of procedures for gathering sufficient appropriate evidence are deliberately limited relative to a reasonable assurance engagement.

1.3. *Use of Report*

This report has been prepared for management of the Company for distribution to the Economic Regulation Authority solely for the purpose of reporting on the compliance of AMS with the Licence conditions. We disclaim any assumptions of responsibility for any reliance on this report to any other person, or for any purpose other than that for which it was prepared.

1.4. *Inherent limitations*

Because of the inherent limitations of any internal control structure, it is possible that fraud, error or non-compliance may occur and not be detected. A review is not designed to detect all instances of non-

compliance of Pacific Hydro's Asset Management System with the conditions of the License, as it is limited primarily to making enquiries, primarily of the Pacific Hydro management and applying analytical and other review procedures.. The limited assurance conclusion expressed in this report has been formed on the above basis.

1.5. Independence

In conducting our engagement, we have complied with the independence requirements of the Australian professional accounting bodies.

1.6. Basis for Qualified Conclusion

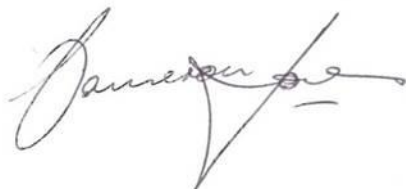
The review identified inadequacies for Asset Management Systems components 1.4, 1.8, 3.2, 3.3, 5.2, 6.5, 7.4, and 9.1 as described in our "Summary of Findings" section 4.

1.7. Conclusion

Based on our review, which is not an audit, except for the matters noted in the Basis for Qualified Conclusion section above, nothing has come to our attention that causes us to believe that Pacific Hydro has not complied, in all material respects in accordance with the asset management conditions of its Electricity Integrated Regional Licence EIRL4 versions 3 and 4 as measured by the licence conditions within the Authority's *Audit and Review Guidelines: Electricity and Gas Licences*, April 2014, for the period 1 July 2011 to 30 June 2014.



PricewaterhouseCoopers



Partner

3 October 2014

2. Definitions

For the purpose of this review report:

“AM” means Asset Management

“AMS” means Asset Management System

“AVR” means Automatic Voltage Regulator

“FMECA” means Failure Modes Effects and Criticality Analysis

“OEM” means Original Equipment Manufacturer

“OPS NAS” means Network-attached Storage

3. Scope of the review

3.1. Review objectives

Under section 14 of the Electricity Industry Act 2004 (WA) and as a condition of its current Electricity Integrated Regional License, Pacific Hydro must provide the Authority with an independent expert review of the effectiveness of the asset management system every 24 months. The purpose of this review is to ensure the licensee is properly managing the maintenance and expansion or reduction of the generating works or transmission/distribution network.

PwC was engaged to conduct the independent review for the period between the July 1, 2011 and the June 30, 2014. The audit period was covered by version 3 (issues 13 January 2011) and version 4 (issue 1 January 2013 and current) of the Ord Hydro Electricity Integrated Regional License (refer to section 8).

A Review Plan dated June 2014 was developed in accordance with the *Audit and Review Guidelines: Electricity and Gas Licences April 2014* utilising the AMS effectiveness framework as the basis of the review.

The framework focussed on the following key asset management processes:

- Asset planning;
- Asset creation and acquisition;
- Asset disposal;
- Environmental analysis;
- Asset operations;
- Asset maintenance;
- Asset management information system;
- Risk management;
- Contingency planning;
- Financial planning;
- Capital expenditure planning; and
- Review of the Asset Management System

3.2. Approach

Our approach for the review involved the following activities, which were undertaken during the period June 2014 to July 2014:

- Utilising the Audit and Review Guidelines as a guide, development of a risk assessment which involved discussions with key staff and document review to assess controls;
- Development of a review plan (see **Appendix 3**) for approval by the Authority and an associated work program;
- Interviews with relevant site level Ord Hydro staff to gain understanding of the process controls (see **Section 3.4**);
- Site visit to Ord Hydro Power Plant at Lake Argyle and Pacific Hydro Kununurra regional office to gain understanding of site based activities and procedures;
- Review of documents, processes, and controls to assess the overall compliance and effectiveness of those processes and controls in accordance with the Audit and Review Guidelines (see **Section 5**); and
- Reporting findings to Pacific Hydro for review and response.

3.3. Review methodology

For each criteria within the key processes listed above, both process and policy definition, and performance ratings were assessed during the review. These ratings are shown in Table 4 and Table 5 below:

Asset management process and policy definition adequacy rating		
Rating	Description	Criteria
A	Adequate defined	<ul style="list-style-type: none"> Processes and policies are documented. Processes and policies adequately document the required performance of the assets. Processes and policies are subject to regular reviews, and updated where necessary. The asset management information system(s) are adequate in relation to the assets that are being managed.
B	Requires some improvement	<ul style="list-style-type: none"> Process and policy documentation requires improvement. Processes and policies do not adequately document the required performance of the assets. Reviews of processes and policies are not conducted regularly enough. The asset management information system(s) require minor improvements (taking into consideration the assets that are being managed).
C	Requires significant improvement	<ul style="list-style-type: none"> Process and policy documentation is incomplete or requires significant improvement. Processes and policies do not document the required performance of the assets. Processes and policies are significantly out of date. The asset management information system(s) require significant improvements (taking into consideration the assets that are being managed).
D	Inadequate	<ul style="list-style-type: none"> Processes and policies are not documented. The asset management information system(s) is not fit for purpose (taking into consideration the assets that are being managed).

Table 4 Audit compliance and controls rating scales

Asset management performance rating		
Rating	Description	Criteria
1	Performing effectively	<ul style="list-style-type: none"> The performance of the process meets or exceeds the required levels of performance. Process effectiveness is regularly assessed and corrective action taken where necessary.
2	Opportunity for improvement	<ul style="list-style-type: none"> The performance of the process requires some improvement to meet the required level.

Asset management performance rating		
Rating	Description	Criteria
		<ul style="list-style-type: none"> Process effectiveness reviews are not performed regularly enough. Process improvement opportunities are not actioned.
3	Corrective action required	<ul style="list-style-type: none"> The performance of the process requires significant improvement to meet the required level. Process effectiveness reviews are performed irregularly, or not at all. Process improvement opportunities are not actioned.
4	Serious action required	<ul style="list-style-type: none"> Process is not performed, or the performance is so poor that the process is considered to be ineffective.

Table 5 Asset management performance rating

Recommendations are required where a process and policy rating is deemed to be either a C or D, and where an asset management performance rating is a 3 or 4.

3.4. Review participants

The asset management system review was conducted largely at Ord Hydro's Kununurra office over a three (3) day period. Ord Hydro representatives present during the review were Darren Sexton (Executive Manager Operations, Australia), Brian Walter (Ord Hydro Manager) and Stuart Lester (Maintenance Technician).

PwC review team consisted of Phil Clarke and Chander Bansal. Both review team members were involved during the entire period of the fieldwork.

Prior to the review a list of documents were collected that were deemed relevant as evidence required for effectiveness rating. These documents are listed under each effectiveness criteria in section 5 Observations.

4. Summary of findings

Refer to detailed findings at Section 5 and Review Plan at Appendix A2 for description of components.

Key process and effectiveness criteria (refer to Audit and Review Guidelines)	Asset management process and policy definition adequacy rating	Asset management performance rating
1. Asset Planning	B	1
1.1 Asset management plan covers key requirements	B	1
1.2 Planning process and objectives reflect the needs of all stakeholders and is integrated with business planning	A	1
1.3 Service levels are defined	A	1
1.4 Non-asset options (e.g. demand management) are considered	C	3
1.5 Lifecycle costs of owning and operating assets are assessed	A	2
1.6 Funding options are evaluated	B	2
1.7 Costs are justified and cost drivers identified	A	1
1.8 Likelihood and consequences of asset failure are predicted	B	3
1.9 Plans are regularly reviewed and updated	A	1
2. Asset creation and acquisition	A	2
2.1 Full project evaluations are undertaken for new assets, including comparative assessment of non-asset solutions	B	2
2.2 Evaluations include all life-cycle costs	A	2
2.3 Projects reflect sound engineering and business decisions	A	2
2.4 Commissioning tests are documented and completed	A	1
2.5 Ongoing legal/environmental/safety obligations of the asset owner are assigned and understood	B	1
3. Asset disposal	B	2
3.1 Under-utilised and under-performing assets are identified as part of a regular systematic review process	B	2

3.2 The reasons for under-utilisation or poor performance are critically examined and corrective action or disposal undertaken	B	3
3.3 Disposal alternatives are evaluated	B	3
3.4 There is a replacement strategy for assets	A	2
4. Environmental analysis	A	2
4.1 Opportunities and threats in the system environment are assessed	A	2
4.2 Performance standards (availability of service, capacity, continuity, emergency response, etc.) are measured and achieved	B	1
4.3 Compliance with statutory and regulatory requirements	A	2
4.4 Achievement of customer service levels	A	1
5. Asset operations	B	2
5.1 Operational policies and procedures are documented and linked to service levels required	A	2
5.2 Risk management is applied to prioritise operations tasks	B	3
5.3 Assets are documented in an Asset Register including asset type, location, material, plans of components, an assessment of assets' physical/structural condition and accounting data	B	2
5.4 Operational costs are measured and monitored	A	2
5.5 Staff resources are adequate and staff receive training commensurate with their responsibilities	B	2
6. Asset maintenance	B	2
6.1 Maintenance policies and procedures are documented and linked to service levels required	A	2
6.2 Regular inspections are undertaken of asset performance and condition	B	2
6.3 Maintenance plans (emergency, corrective and preventative) are documented and completed on schedule	A	2
6.4 Failures are analysed and operational/maintenance plans adjusted where necessary	B	2

6.5 Risk management is applied to prioritise maintenance tasks	B	3
6.6 Maintenance costs are measured and monitored	A	2
7. Asset management information system	A	1
7.1 Adequate system documentation for users and IT operators	B	2
7.2 Input controls include appropriate verification and validation of data entered into the system	B	2
7.3 Logical security access controls appear adequate, such as passwords	A	1
7.4 Physical security access controls appear adequate	A	1
7.5 Data backup procedures appear adequate	A	1
7.6 Key computations related to licensee performance reporting are materially accurate	A	1
7.7 Management reports appear adequate for the licensee to monitor licence obligations	A	1
8. Risk management	A	2
8.1 Risk management policies and procedures exist and are being applied to minimise internal and external risks associated with the asset management system	A	2
8.2 Risks are documented in a risk register and treatment plans are actioned and monitored	A	1
8.3 The probability and consequences of asset failure are regularly assessed	B	2
9. Contingency planning	B	3
9.1 Contingency plans are documented, understood and tested to confirm their operability and to cover higher risks	B	3
10. Financial planning	B	2
10.1 The financial plan states the financial objectives and strategies and actions to achieve the objectives	A	2
10.2 The financial plan identifies the source of funds for capital expenditure and recurrent costs	B	2
10.3 The financial plan provides projections of operating statements (profit and loss) and statement of financial position (balance sheets)	A	1

10.4 The financial plan provide firm predictions on income for the next five years and reasonable indicative predictions beyond this period	A	2
10.5 The financial plan provides for the operations and maintenance, administration and capital expenditure requirements of the services	B	2
10.6 Significant variances in actual/budget income and expenses are identified and corrective action taken where necessary	B	2
11. Capital expenditure planning	A	2
11.1 There is a capital expenditure plan that covers issues to be addressed, actions proposed, responsibilities and dates	A	1
11.2 The plan provides reasons for capital expenditure and timing of expenditure	A	2
11.3 The capital expenditure plan is consistent with the asset life and condition identified in the asset management plan	A	1
11.4 There is an adequate process to ensure that the capital expenditure plan is regularly updated and actioned	B	2
12. Review of AMS	A	1
12.1 A review process is in place to ensure that the asset management plan and the asset management system described therein are kept current	A	1
12.2 Independent reviews (eg internal audit) are performed of the asset management system	A	1

Table 6 System effectiveness summary

5. Detailed observations

Observations for each review criteria are summarised in Table 7 below.

Effectiveness criteria	Adequacy rating	Performance rating	Documents and procedures checked	Observations
1. Asset planning				
1.1 Asset management plan covers key requirements	B	1	FY15 Asset management Plan Appendix; Asset management manual	Checked and verified Asset Management Plan, FY15 Appendix. The long term plan is to merge the two documents for one Asset Management Manual. The existing Appendix and Plan consist of most essential elements of good practice asset management.
Recommendation: Nil			Action Plan: Nil	
1.2 Planning process and objectives reflect the needs of all stakeholders and is integrated with business planning	A	1	FY15 Asset management Plan Appendix; 2014 Planning overview presentation; 2014 Onsite planning workshop; Asset management manual	Asset Management Plan and Business Planning presentation sighted which outline the business objectives and the link between these and the assets and PPAs. Asset planning covers all relevant sites and personnel involved.
Recommendation: Nil			Action Plan: Nil	
1.3 Service levels are defined	A	1	Executive summary BP 2014-16; Power Purchase Agreements; Annual reconciliation reports	Horizon Power and ADM Power Purchase Agreements (PPAs) outline required level of services to be provided to the customers. Business planning and asset management plan consider those requirements. Annual reconciliation reports demonstrate compliance with the PPA requirements.
Recommendation: Nil			Action Plan: Nil	
1.4 Non-asset options (e.g. demand	C	3	Asset management manual;	During the review period there were no

management) are considered ²			Asset management plan; Previous asset management review report	opportunities identified where non-asset solutions were appropriate. While there is an informal process to consider such solutions while planning for new assets, this is not formalised in any existing policy, process or procedure. Recommendation from the previous review has been closed due to confusion on the meaning of the non-asset solutions.
Recommendation: Complete the closed out item 1.3 from the previous (2008-2011) asset management review recommendations.			Action Plan: Identify any existing or develop new procedure and include in the asset management system.	
1.5 Lifecycle costs of owning and operating assets are assessed	A	2	FY15 Asset management Plan Appendix;	Sighted the asset management plan appendix which includes the details of the lifecycle cost of owning and operating assets. Those costs are assessed as per the budget cycle.
Recommendation: Nil			Action Plan: Nil	
1.6 Funding options are evaluated	B	2	Asset management plan; Asset management system	While there is no mention of funding options in the Asset Management Plan and Systems, expenditure is required to be classified between Capex and Opex. Funding options include owner purchase or lease, and in some cases customer funded. Various options are informally considered while preparing the expenditure approval requests.
Recommendation: Nil			Action Plan: Nil	
1.7 Costs are justified and cost drivers identified	A	1	2014 Planning overview presentation; 2014 Onsite planning workshop; FY15 Asset	The asset management plan appendix details breakdown of OPEX and CAPEX costs. The expenditure needs formal board approval with a

² Although Pacific Hydro did not perform non-asset solution acquisition during the review period, it is the reviewer's position, as well as a requirement of ISO 55001, that an effective and efficient Asset Management System contain all policies, processes, procedures and plans relating to the whole of life asset activities, including those relating to the consideration of non-asset solutions to meet a business requirement. Consequently, the reviewer has rated 1.4 a C3 and recommends Pacific Hydro develop and implement those policies and processes in their Asset Management System

			management Plan Appendix	business case associated with it and the costs are driven by the long term business requirements, and current condition of assets and as a result of maintenance and operations reviews.
Recommendation: Nil			Action Plan: Nil	
1.8 Likelihood and consequences of asset failure are predicted	B	3	Risk Wizard; Risk register; Operations Performance Review June 2013 – Exec. Summary	Maintenance and Condition Monitoring requires that maintenance reviews be conducted to determine root causes and consequences of failures. While most of the failures are recorded in the incident register and analysis conducted to find the root cause, utilisation of formal techniques such as FMECA and RCA has not been considered during the review period.
Recommendation: Undertake FMECA studies to identify failures modes of critical assets and the consequences of failures. Keep the results updated as change occurs within operational, engineering, and regulatory requirements. Develop a plan to mitigate identified failures associated with critical assets.			Action Plan: Update asset management plan to include findings of the FMECA exercises.	
1.9 Plans are regularly reviewed and updated	A	1	Asset management plan; Asset management manual; FY15 Asset management Plan Appendix	Sighted recent and current versions of the asset management plan appendix and plan. There is work in progress to merge the above two documents into manual. All asset management related plans are regularly reviewed as per the business requirements.
Recommendation: Nil			Action Plan: Nil	
2. Asset creation and acquisition				
2.1 Full project evaluations are undertaken for new assets, including comparative assessment of non-asset solutions	B	2	Ord River Hydro Diesel Study Conducted by ABB; Samples of capital expenditure business case	Major capital expenditure plans are evaluated as per business policies for the board approval. Assessment based on non-asset solutions is not included in the asset management plan. Appropriate engineering and financial evaluations are undertaken to justify

				the project.
Recommendation: Nil			Action Plan: Nil	
2.2 Evaluations include all life-cycle costs	A	2	Samples of capital expenditure business case; FY15 Asset management Plan Appendix	There are formal processes within the asset management system to include full life cycle cost analysis for asset creation and acquisition. While no major assets have been acquired or created during the review period, asset management plan appendix includes a life cycle analysis model to analyse costs.
Recommendation: Nil			Action Plan: Nil	
2.3 Projects reflect sound engineering and business decisions	A	2	Ord River Hydro Diesel Study Conducted by ABB; Samples of capital expenditure business case	There are formal processes within the asset management system to consider full engineering design and risk to business for all new major projects. While no major projects have been undertaken during the review period, asset management plan appendix and plan include the requirements of analysis of engineering and business decisions.
Recommendation: Nil			Action Plan: Nil	
2.4 Commissioning tests are documented and completed	A	1	Verified commissioning test reports of the new revenue meters, generation protection, and AVR.	No new major commissioning executed during the review period.
Recommendation: Nil			Action Plan: Nil	
2.5 Ongoing legal/environmental/safety obligations of the asset owner are assigned and understood	B	1	Annual compliance report; Operations Performance Review June 2013 – Exec. Summary; Risk Wizard; Breach register; ISO14001 certificate; Performance audit and AMS review reports	Asset Management Policy indicates commitment to meeting all legal, environmental and safety obligations. Regular audits are performed to make sure the compliance with the requirements. Site level OH&S obligations are complied with by all site personnel. No examples identified where legal/environmental or safety obligations were not met in relation with the capital projects undertaken

				during the review period.
Recommendation: Nil			Action Plan: Nil	
3. Asset disposal				
3.1 Under-utilised and under-performing assets are identified as part of a regular systematic review process	B	2	Asset management manual; Asset management plan; Operations Performance Review June 2013 – Exec. Summary	Operations performance review is undertaken to assess the current performance and condition of the assets. This is used to identify both under-utilised and underperforming assets in order to develop corrective action plans (asset management plans). Recent maintenance and operations review has recommended some areas of improvements.
Recommendation: Nil			Action Plan: Nil	
3.2 The reasons for under-utilisation or poor performance are critically examined and corrective action or disposal undertaken	B	3	Operations Performance Review June 2013 – Exec. Summary; Capital project plans for new assets; Asset management plan	Although Pacific Hydro's Operational Performance Review Process covers recommendations for disposal where appropriate, none of the assets have ever been appropriately disposed of. Poor performance and underutilisation is used to replace the assets to maintain the required performance. However, the replaced assets are not disposed of.
Recommendation: Develop an asset disposal process including various alternative options assessment. Utilise Operational Performance Review process for disposal decision making. Update asset management system and capital expenditure planning process accordingly.			Action Plan: Update asset management plan to include and utilise asset disposal process based upon the underutilisation and poor performance of assets.	
3.3 Disposal alternatives are evaluated ³	B	3	Capital project plans for new assets; Asset management plan; Asset management manual	No asset disposal has taken place in the review period. However, there is no existing policy, process, or procedure within the AMS for asset disposal should asset disposal be required.
Recommendation: Develop an asset disposal			Action Plan: Include disposal alternative	

³ Although Pacific Hydro did not perform any asset disposals during the review period, it is the reviewer's position, as well as a requirement of ISO 55001, that an effective and efficient Asset Management System contain all policies, processes, procedures and plans relating to the whole of life asset activities, including those relating the responsible disposal of assets at the end of their life. Consequently, the reviewer has rated 3.3 a C3 and recommends Pacific Hydro develop and implement those policies and processes in their Asset Management System.

evaluation process including alternative options. Identify opportunities for asset disposals as per the process.		evaluation process to the asset management plan.		
3.4 There is a replacement strategy for assets	A	2	Operations Performance Review June 2013 – Exec. Summary; Asset management plan; FY15 Asset management Plan Appendix; 2014 Planning overview presentation	Asset disposal requires that disposal of assets is planned through the Asset Planning process. Operational Performance Review Process requires that decisions to dispose assets are based on asset condition and recommendations are put forward for replacement where necessary. Revenue meters were replaced during the review period as a result of poor calibration results. Various options and strategies are considered in the asset management plan.
Recommendation: Nil			Action Plan: Nil	
4. Environmental analysis				
4.1 Opportunities and threats in the system environment are assessed	A	2	Site management plan; Asset management and Site HSE policy; ISO 14001 certification; Risk register and Risk Wizard	Risk Wizard sighted which includes a list of all business risks. Local site level emergency plans are in place and staff aware of those plans. New opportunities and threats to the business are assessed in the annual asset management and business plans
Recommendation: Nil			Action Plan: Nil	
4.2 Performance standards (availability of service, capacity, continuity, emergency response, etc.) are measured and achieved	B	1	Operations monthly report; Corporate KPIs; PPAs;	Horizon Power's Power Purchase Agreement Annual Reconciliation report sighted. Compliance with the Major KPIs achieved well within limits during this review period.
Recommendation: Nil			Action Plan: Nil	
4.3 Compliance with statutory and regulatory requirements	A	2	Risk and Compliance Register (Risk Wizard); Performance audit and AMS review reports; Asset management policy	Asset Management Policy" sighted pledges commitment to comply with all statutory and regulatory requirements. Compliancy Policy sighted which outlines the framework for compliance across all assets.

				Compliance Register in Risk Wizard sighted which details generic statutory and regulatory requirements for all Pacific Hydro assets. Annual Compliance Report to the ERA for the year 2011 sighted.
Recommendation: Nil			Action Plan: Nil	
4.4 Achievement of customer service levels	A	1	PPAs; Operations monthly report; Operations Performance Review June 2013 – Exec. Summary; Incident register; Annual reconciliation reports	Monthly Report sighted which outlines key performance measures. This report is published on a monthly basis. All measures were observed to be well within service levels stated in the PPA. ADM and Horizon Power PPAs sighted. Power Purchase Agreement Annual Reconciliation reports sighted which also outline key performance indicators.
Recommendation: Nil			Action Plan: Nil	
5. Asset operations				
5.1 Operational policies and procedures are documented and linked to service levels required	A	2	OEM Manuals; Operating protocols with Water Corp WA; SOPs as per OEM	Sighted many OEM operating manuals and procedures at both the station and the Kununurra Office. Operations of the assets are in accordance with these manuals.
Recommendation: Nil			Action Plan: Nil	
5.2 Risk management is applied to prioritise operations tasks	B	3	Risk assessment methodology; Risk register; Risk Wizard; Asset management plan	Risk based priorities are assigned on an annual basis. Operations onsite are largely automated and therefore no formal risk based priorities have been assigned to tasks being performed onsite.
Recommendation: Develop a risk based operations prioritisation process to ensure the safety of the assets, people, and environment and update asset management system and operations management system / manuals accordingly.			Action Plan: Undertake operations task analysis and assign task priorities into the task management system. Make operating staff aware of changes and provide necessary training if required.	
5.3 Assets are documented in an Asset Register including asset type, location, material, plans of components,	B	2	CMMS: MEX and WTG; Asset report for Ord Hydro; Metering database	Asset details are recorded within Maintenance management systems MEX and WTG. Considering very little complexity of the assets, the details of the

an assessment of assets' physical/structural condition and accounting data				asset register are sufficient to ensure the required outcomes. No equipment sighted on tour of the substation in poor condition.
Recommendation: Nil			Action Plan: Nil	
5.4 Operational costs are measured and monitored	A	2	SAP Monthly financial report; Operations monthly report; FY15 Asset management Plan Appendix	Budget and Monthly Report sighted. Asset Management Appendix Financial Modelling for Asset Lifecycle sighted which requires operational costs to be measured and monitored.
Recommendation: Nil			Action Plan: Nil	
5.5 Staff resources are adequate and staff receive training commensurate with their responsibilities	B	2	Operations training plan;	New starter training and induction is performed when a new employee starts work. Asset management system training is provided informally. A new training plan has been drafted to monitor training needs and progress. No formal skills matrix exists. Employee's tickets and licences are recorded in the database.
Recommendation: Nil			Action Plan: Nil	
6. Asset maintenance				
6.1 Maintenance policies and procedures are documented and linked to service levels required	A	2	OEM Manuals; Maintenance plans in MEX and WTG; Work Orders; PPAs	Maintenance plans are recorded within MEX and WTG systems. Planned and unplanned outages are measured and recorded to ensure they comply with the required levels. Weekly inspection checklists exist in OEM Manuals but those are not recorded in MEX and WTG.
Recommendation: Nil			Action Plan: Nil	
6.2 Regular inspections are undertaken of asset performance and condition	B	2	Operations Performance Review June 2013 – Exec. Summary; Inspection plans and checklists; O&M Manuals	The majority of the planned maintenance tasks in MEX are condition based monitoring tasks. A station site visit revealed general overall good condition of the assets. Basic generation and lost time statistics are monitored and reported on a monthly and annual

				basis. The inspection plans are not included in the MEX or WTG systems.
Recommendation: Nil			Action Plan: Nil	
6.3 Maintenance plans (emergency, corrective and preventative) are documented and completed on schedule	A	2	OEM Manuals; Maintenance plans in MEX and WTG; Work Orders	Twelve (12) monthly shutdown maintenance is planned in the MEX and WTG. All maintenance backlog items are combined within the next 12 monthly shutdown. Incident register is used to record all failures and root cause analysis, and planned action taken.
Recommendation: Nil			Action Plan: Nil	
6.4 Failures are analysed and operational/maintenance plans adjusted where necessary	B	2	Incident register; RCM and FMECA processes	A maintenance review was performed in 2012 however, none of the recommendations have been implemented during the review period. Failure analyses are not recorded in MEX and Maintenance plans do not get adjusted based upon the failures.
Recommendation: Nil			Action Plan: Nil	
6.5 Risk management is applied to prioritise maintenance tasks	B	3	Risk assessment methodology; Risk register; Risk Wizard; Asset management plan; Maintenance plans	Priority is not assigned to the work orders from MEX and WTG system. Priority is assigned based on individuals experience and knowledge. Safety critical parts not identified and recorded in the system.
Recommendation: Develop a risk based maintenance and inspection plans to prioritise maintenance tasks. Update asset management system and MEX and WTG maintenance management system accordingly.			Action Plan: Undertake maintenance task analysis and assign task priorities into the MEX and WTG. Make maintenance staff aware of changes and provide necessary training if required.	
6.6 Maintenance costs are measured and monitored	A	2	SAP Monthly financial report; Operations monthly report; FY15 Asset management Plan Appendix	Maintenance costs are forecasted in the budget and reported through the monthly report and Asset management plan appendix.
Recommendation: Nil			Action Plan: Nil	
7. Asset management information system				
7.1 Adequate system documentation for	B	2	OEM Manuals for	Operator manuals for WTG do not exist. Other

users and IT operators			NEXO system; MEX; SAP; SCADA	manuals are adequate for users.
Recommendation: Nil			Action Plan: Nil	
7.2 Input controls include appropriate verification and validation of data entered into the system	B	2	System manuals; User training plans; Access control	System owners have full authority to enter data in the system. There is no formal data verification and validation process in place. Considering limited and low level of configuration changes to the system, there is little need for this process.
Recommendation: Nil			Action Plan: Nil	
7.3 Logical security access controls appear adequate, such as passwords	A	1	IT password policies; Access control register; System Licences	Only 1 user licence for MEX system, so only Station Manager can access MEX on the local computer. SCADA and NEXO systems are appropriately password protected.
Recommendation: Nil			Action Plan: Nil	
7.4 Physical security access controls appear adequate	A	1	Visual verification; Key register; Signage	Kununurra Office has 3 CCTV cameras which record for a 2 week period. All doors contain locks and there are motion-sensors linked to an alarm system. The station has a pad locked fence to the drive access and there is further barbed wire fencing surrounding the yard. The doors accessing the power station were monitored with proximity switches. Two switch yards visited contained pad locked or password locked gates with barbed wire fencing. It was noted during site visits that external "Warning - High Voltage" signage around the power station and switch yard was in poor condition and warnings were illegible.
Recommendation: Replace high Voltage warning signage around the power station and switch yard sites to ensure it complies with standards.			Action Plan: Include regular inspections of power station and switch yard statutory warning signage in site maintenance plans.	

7.5 Data backup procedures appear adequate	A	1	IT system backup policy; SCADA backup	SCADA is backed up on the OPS NAS drive in Melbourne office. In addition to daily backup there is a quarterly backup which is also stored in the Melbourne office. Other networked information such as local drives are backed up daily.
Recommendation: Nil			Action Plan: Nil	
7.6 Key computations related to licensee performance reporting are materially accurate	A	1	Horizon Power annual reconciliation reports; PPAs; Operations monthly report;	Horizon Power's Power Purchase Agreement Annual Reconciliation Reports 2012 and 2013 describe the calculations as sighted in the respective PPA.
Recommendation: Nil			Action Plan: Nil	
7.7 Management reports appear adequate for the licensee to monitor licence obligations	A	1	Performance audit and AMS review reports;	An Annual Power Purchase Agreement Reconciliation report is provided to ADM. A Monthly Report contains KPI monitoring. An annual Compliance Report and all communication with the Authority is documented and available for reference.
Recommendation: Nil			Action Plan: Nil	
8. Risk management				
8.1 Risk management policies and procedures exist and are being applied to minimise internal and external risks associated with the asset management system	A	2	Risk register; Risk Wizard; Incident report register; Audit and review reports; ISO 14001 certificate	Sighted Risk Management Policy outlining the commitment and approach to managing risk. Risk Wizard is used to manage all business as well as regulatory risks. Risk management system comprising of a risk matrix is used to assess and mitigate risks. Regular audits are performed to make sure that the systems comply with the applicable requirements.
Recommendation: Nil			Action Plan: Nil	
8.2 Risks are documented in a risk register and treatment plans are actioned and monitored	A	1	Risk register; Risk Wizard; Incident report register	Risks are documented in the Risk Wizard database. An action plan is prepared to treat all the risks. Full project status with the details of the responsible person is available in the

				plan.
Recommendation: Nil			Action Plan: Nil	
8.3 The probability and consequences of asset failure are regularly assessed	B	2	Operations performance report; Reliability report; Incident register; Maintenance review report	Regular Maintenance and Condition Monitoring inspections are carried out by the operators. All failures are recorded in the incident register and an analysis is performed to assess the root cause of the failure. While this is more retrospective in approach, it satisfies the intention to improve long term reliability of the assets. No formal FMECA studies were undertaken during the review period.
Recommendation: Nil			Action Plan: Nil	
9. Contingency planning				
9.1 Contingency plans are documented, understood and tested to confirm their operability and to cover higher risks	B	3	Contingency plans; Site emergency plans; Risk register;	Requirements to document contingency plans have been added into the asset management system, which are aligned with the identified risks. No major disaster contingency plans have been documented. None of the existing contingency plans have been tested during the review period.
Recommendation: Conduct a thorough risk assessment and identify opportunities to develop more disaster contingency plans and test those plans on a regular basis.			Action Plan: Develop new disaster recovery contingency plans and update risk register. Keep records of regular testing.	
10. Financial planning				
10.1 The financial plan states the financial objectives and strategies and actions to achieve the objectives	A	2	FY15 Asset management Plan Appendix; 2014 Planning overview presentation; 2014 Onsite planning workshop; Executive summary BP 2014-16	Business Plan 2014-16 sighted outlining the business strategies and objectives. "Corporate Evaluation Model" sighted. The budget (sighted) provides more detail for the current year. Ord Asset Management Plan sighted which details annual generation, revenue and cost targets and provides a list of actions required to achieve those objectives.
Recommendation: Nil			Action Plan: Nil	
10.2 The financial	B	2	FY15 Asset	Asset Management Plan

plan identifies the source of funds for capital expenditure and recurrent costs			management Plan Appendix; 2014 Planning overview presentation; 2014 Onsite planning workshop; Executive summary BP 2014-16	(sighted) provides the amount of capital expenditure planned for each year. The plan assumes that all CAPEX is internally funded. However, it is understood that some items will likely be jointly funded with the customer. This is handled informally at the time of negotiation for the joint funding.
Recommendation: Nil			Action Plan: Nil	
10.3 The financial plan provides projections of operating statements (profit and loss) and statement of financial position (balance sheets)	A	1	FY15 Asset management Plan Appendix; 2014 Planning overview presentation; Financial management procedure	Evaluation Model sighted which provides EBIT projections and provides inputs for balance sheets. Financial Management Procedure sighted which provides a high level procedure for managing budgets.
Recommendation: Nil			Action Plan: Nil	
10.4 The financial plan provide firm predictions on income for the next five years and reasonable indicative predictions beyond this period	A	2	FY15 Asset management Plan Appendix; 2014 Planning overview presentation; Executive summary BP 2014-16	Evaluation Model sighted which provides EBIT projections and provides inputs for balance sheets. Financial Management Procedure sighted which provides a high level procedure for managing budgets.
Recommendation: Nil			Action Plan: Nil	
10.5 The financial plan provides for the operations and maintenance, administration and capital expenditure requirements of the services	B	2	FY15 Asset management Plan Appendix; 2014 Planning overview presentation; Executive summary BP 2014-16	Evaluation Model sighted which provides EBIT projections and provides inputs for balance sheets. Financial Management Procedure sighted which provides a high level procedure for managing budgets.
Recommendation: Nil			Action Plan: Nil	
10.6 Significant variances in actual/budget income and expenses are identified and corrective action taken where necessary	B	2	FY15 Asset management Plan Appendix; 2014 Planning overview presentation; SAP reports; Executive summary	Monthly report sighted which compares budget vs actual income and expenses. A formal meeting is held to discuss major variances with corrective actions developed where needed. Financial Management Procedure sighted which

			BP 2014-16	specifies a variance of greater than \$100k to be analysed.
Recommendation: Nil			Action Plan: Nil	
11. Capital expenditure planning				
11.1 There is a capital expenditure plan that covers issues to be addressed, actions proposed, responsibilities and dates	A	1	Asset management plan; FY15 Asset management Plan Appendix	Asset Management Plan outlines the annual CAPEX requirements based on the planned activities. FY15 Asset management Plan Appendix sighted outlining high level actions to be taken to achieve objectives.
Recommendation: Nil			Action Plan: Nil	
11.2 The plan provides reasons for capital expenditure and timing of expenditure	A	2	Asset management plan; FY15 Asset management Plan Appendix	Asset Management Plan outlines annual CAPEX requirements based on the planned activities. The structure shows the link between the expenditure and the strategy which supports the business objectives. Executive Summary BP 2014-16 outlines the business requirements. FY15 Asset management Plan Appendix sighted outlining high level actions to be taken to achieve objectives.
Recommendation: Nil			Action Plan: Nil	
11.3 The capital expenditure plan is consistent with the asset life and condition identified in the asset management plan	A	1	Asset management plan; FY15 Asset management Plan Appendix	FY15 Asset management Plan Appendix and Asset management plans comprehensively outline the requirements to consider prior to the development of the capital budget. These considerations include the asset life cycle as well as current asset condition.
Recommendation: Nil			Action Plan: Nil	
11.4 There is an adequate process to ensure that the capital expenditure plan is regularly updated and actioned	B	2	Asset management plan; FY15 Asset management Plan Appendix	Asset management plans and FY15 Asset management Plan Appendix require capital expenditure costs are monitored on monthly basis however, the action plan is only updated on an ad-hoc basis. Considering none of the major capital projects undertaken during

				the review period, the processes seem to have no significant impact on the performance of the assets.
Recommendation: Nil			Action Plan: Nil	
12. Review of AMS				
12.1 A review process is in place to ensure that the asset management plan and the asset management system described therein are kept current	A	1	Asset management plan; FY15 Asset management Plan Appendix; Executive summary BP 2014-16;	Latest copies of the asset management plan, FY15 Asset management Plan Appendix, and Executive summary BP 2014-16 shows that a review process is in place and the documents are kept current. Work is in progress to merge asset management plan and FY15 Asset management Plan Appendix into one Asset management manual.
Recommendation: Nil			Action Plan: Nil	
12.2 Independent reviews (e.g. internal audit) are performed of the asset management system	A	1	Asset management plan; FY15 Asset management Plan Appendix; Executive summary BP 2014-16; AMS Review report	Asset Management review is conducted to determine: The developed elements; The elements in use; Performance of the elements. Regular audits are also conducted to benchmark asset management activities with good practice industry standards.
Recommendation: Nil			Action Plan: Nil	

Table 7 Detailed observations, recommendations, and action plan

It is auditor's view that for an effective and efficient Asset Management System, processes and procedures related to the whole of life asset related activities should be developed and implemented within the asset organisation. Although Pacific Hydro did not perform non-asset acquisition and asset disposal activities during the review period, it is a good industry practice as well as a requirement of International Standard ISO 55001 that asset organisation must incorporate those activities into organisation's Asset Management System via its Strategic Asset Management Plan. Therefore, auditor has rated 1.4 a C3 and 3.3 a B3 respectively and recommends Pacific Hydro to develop and implement those activities into their Asset Management System

6. Recommendations

The recommendations resulting from this review are detailed in the Table 8 below:

Effectiveness criteria	Recommendations
1.4 Non asset options (e.g. demand management) are considered.	Complete the closed out item 1.3 from the previous (2008-2011) asset management review recommendations.
1.8 Likelihood and consequences of asset failure are predicted.	Undertake FMECA studies to identify failures modes of critical assets and the consequences of failures. Keep the results updated as change occurs within operational, engineering, and regulatory requirements. Develop a plan to mitigate identified failures associated with critical assets.
3.2 The reasons for under-utilisation or poor performance are critically examined and corrective action or disposal undertaken.	Develop an asset disposal process including various alternative options assessment. Utilise Operational Performance Review process for disposal decision making. Update asset management system and capital expenditure planning process accordingly.
3.3 Disposal alternatives are evaluated.	Develop an asset disposal evaluation process including alternative options. Identify opportunities for asset disposals as per the process.
5.2 Risk management is applied to prioritise operational tasks.	Develop a risk based operations prioritisation process to ensure the safety of the assets, people, and environment and update asset management system and operations management system / manuals accordingly.
6.5 Risk management is applied to prioritise maintenance tasks.	Develop a risk based maintenance and inspection plans to prioritise maintenance tasks. Update asset management system and MEX and WTG maintenance management system accordingly.
7.4 Physical security access controls appear adequate	Replace high Voltage warning signage around the power station and switch yard sites to ensure it complies with standards.
9.1 Contingency plans are documented, understood and tested to confirm their operability and to cover higher risks.	Conduct a thorough risk assessment and identify opportunities to develop more disaster contingency plans and test those plans on a regular basis.

Table 8 Recommendations

7. Actions from the previous review

This review considers how Pacific Hydro has progressed against the post review implementation plan detailed in the June 2011 AMS review report. Our assessment of Pacific Hydro's progress in implementing the action plan specified in the post review implementation plan is provided below in both a summarised and detailed follow up format.

The actions recommended during the previous review to address identified improvements are listed in the Table 9 below.

7.1. Pacific Hydro's arrangement for monitoring progress

- Pacific Hydro utilises the "Risk Wizard" program to monitor compliance with its Licence obligations;
- Action plans for each recommendation from the previous performance audit are recorded in the Project Register;
- The relevant Manager is responsible for monitoring compliance with regulatory obligations, including management of risk in the Risk Wizard; and
- Designated managers are responsible for managing and reporting compliance with obligations.

7.2. Summary of post review implementation plan progress

Table 9 below shows recommendations made during the previous AMS Review which has been completed.

Ref No.	Recommendation	Licencee's Action	Documents / Evidence Gathered	Further Action Required
1.3	Include in the requirement for assessment of non-asset solutions in the Asset Management System Framework and any other necessary documentation	This item was not actioned due to confusion on the meaning of "non-asset" solutions.	Nil	Update asset management system or procedures to include non-asset solutions.
3.1	Conduct an Operational Performance Review as per the Pacific Hydro OPR process by the end of July 2013	Operational performance review completed on July 2013.	Verified Operations Performance Review report for Ord Power Station dated June 2013.	Nil
4.3	Develop an Ord Hydro specific register of statutory and regulatory requirements including reporting and monitoring actions to ensure compliance	Compliance register has been setup in December 2012.	Verified "Risk Wizard" system to store electronically and manage all compliance requirements.	Nil
5.5	Plan specific dates for various training and follow through on training plan, documenting training as it	Training plan drafted and database in place to monitor training	Confirmed two new appointments at Kununurra office to assist operations	Nil

Ref No.	Recommendation	Licencee's Action	Documents / Evidence Gathered	Further Action Required
	occurs	progress.	and maintenance activities at Ord hydro station. Training for all staff is planned in the Operations Training Plan.xls document.	
7.2	Carry out the verification test for the Energy Allocation functionality configured into the Ord Hydro SCADA System when lake conditions are appropriate	Energy allocation functionality Test completed in August 2011.	Commissioning Report & LOGs - Pacific Hydro - Ord AVR - Unit A	Nil
8.3	Include in the Asset Management System, or any other relevant procedure, that plans must be in place to periodically review and update the FMECA	Requirements of FMECA and RCM are included in the Asset Management Plan.	Verified requirements of FMECA and RCM included in the Asset Management plan.	Nil
9.1	Update the AMS Framework , or other relevant procedure, to include a requirement to develop site specific contingency plans that are regularly reviewed and tested to confirm the expected results	Requirements to develop contingency plans added in the asset management system.	Verified requirements of developing contingency plans added to the asset management system.	Nil

Table 9 Previous review implementation plan progress

8. Changes to the Licence

PwC has no recommendations to make with regards to changes to the Licence EIRL4.

The changes occurred in the Licence EIRL4 during the review period are summarised in Table 10 below:

Licence EIRL4	Changes occurred
Version 3	Licence version 3 was the previous version since January 13, 2011.
Version 4	Licence Version 4 is the current version since January 1, 2013.

Table 10 Changes to the Licence

Appendix A. - Appendices

A.1. Post review implementation plan

Table 11 below outlines the implementation plan for the recommendations made as a result of the asset management system review. While the recommendations were developed as part of the review process, the actions assigned, person responsible and completion date have been developed by the licensee and do not form part of PwC's opinion.

Recommendation	Action	Person responsible	Completion date
Complete the closed out item 1.3 from the previous (2008-2011) asset management review recommendations.	Identify any existing or develop new procedure and include in the asset management system.	Executive Manager Operations	31 March 2015
Undertake FMECA studies to identify failures modes of critical assets and the consequences of failures. Keep the results updated as change occurs within operational, engineering, and regulatory requirements. Develop a plan to mitigate identified failures associated with critical assets.	Update asset management plan to include findings of the FMECA exercises.	Executive Manager Operations	31 December 2014
Develop an asset disposal process including various alternative options assessment. Utilise Operational Performance Review process for disposal decision making. Update asset management code and capital expenditure planning process accordingly.	Update asset management plan to include and utilise asset disposal process based upon the underutilisation and poor performance of assets.	Executive Manager Operations	30 June 15
Develop an asset disposal evaluation process including alternative options. Identify opportunities for asset disposals as per the process.	Include disposal alternative evaluation process to the asset management plan.	Executive Manager Operations	30 June 2015
Develop a risk based operations	Undertake operations task analysis and assign	Executive Manager Operations	31 December 2015

prioritisation process to ensure the safety of the assets, people, and environment and update asset management system and operations management system / manuals accordingly.	task priorities into the task management system. Make operating staff aware of changes and provide necessary training if required.		
Develop a risk based maintenance and inspection plans to prioritise maintenance tasks. Update asset management system and MEX and WTG maintenance management system accordingly.	Undertake maintenance task analysis and assign task priorities into the MEX and WTG. Make maintenance staff aware of changes and provide necessary training if required.	Executive Manager Operations	31 December 2015
Replace high Voltage warning signage around the power station and switch yard sites to ensure it complies with standards.	Include regular inspections of power station and switch yard statutory warning signage in site maintenance plans.	Ord Hydro Manager	1 January 2015
Conduct a thorough risk assessment and identify opportunities to develop more disaster contingency plans and test those plans on a regular basis.	Develop new disaster recovery contingency plans and update risk register. Keep records of regular testing.	Executive Manager Operations	31 December 2015

Table 11 Post review implementation plan

A.2. Review plan

Effectiveness Criteria	Consequence (1=minor, 2=moderate, 3=major)	Likelihood (A=likely, B=probable, C=unlikely)	Inherent Risk (low, medium, high)	Adequacy of existing controls (S=strong, M=moderate, W=weak)	Audit Priority (refer to Table 15 for audit priority ratings)						The audit will check the following working documents as appropriate	The audit will check the following procedures	Persons to be interviewed	Comment
					1	2	3	4	5	NA				
1. Asset planning														
Planning process and objectives reflect the needs of all stakeholders and is integrated with business planning	3	C	High	S		√					Business plan Asset Management plan		Darren Sexton	Asset Management activities are based on the principles of PAS55
Service levels are defined	2	B	Medium	W			√				Asset Management Plan	PPA Project Plans	Darren Sexton	
Non-asset options (e.g. demand management) are considered	2	B	Medium	M				√			Asset Management Plan Project Plan		Darren Sexton	
Lifecycle costs of owning and operating assets are assessed	1	C	Low	S					√		Life cycle planning tool		Darren Sexton	

Funding options are evaluated	2	B	Medium	S				√			Project plan		Darren Sexton	
Costs are justified and cost drivers identified	2	B	Medium	S				√			Project plan		Darren Sexton	
Likelihood and consequences of asset failure are predicted	3	B	High	W	√						Asset management plan Life cycle planning		Darren Sexton	RCM and FMECA included in the AMS. Verify examples of assessments
Plans are regularly reviewed and updated	2	B	Medium	S				√			Asset management plan Project plan		Darren Sexton	Verify currency and update records of the plan
2. Asset creation and acquisition														
Full project evaluations are undertaken for new assets, including comparative assessment of non-asset solutions	3	C	High	M		√					Samples of capital expenditure business cases	Capex approval process	Darren Sexton	Verify the contents of the business case for effectiveness
Evaluations include all life-cycle costs	2	B	Medium	M				√			Samples of business plans		Darren Sexton	Verify the contents of the business case for effectiveness
Projects reflect sound engineering and business decisions	2	C	Medium	M				√			Design standards, Fit for purpose equipment	Internal engineering standards	Darren Sexton	Check samples of projects and verify decision making
Commissioning tests are documented and completed	3	C	High	M		√					Commissioning reports, engineering standards		Darren Sexton	Check samples of last commissioning checklists / procedures

Ongoing legal/environmental/safety obligations of the asset owner are assigned and understood	3	C	High	S		√					OHS Management plan, Environment management system	Contractor management system, Safety Policy, ISO14001 Certification	Darren Sexton	Check recent examples of work method statements, Safety records, audit reports
3. Asset disposal														
Under-utilised and under-performing assets are identified as part of a regular systematic review process	2	B	Medium	M				√			Asset management plan, Incident register, PPAs	Asset Management Policy, Operational performance review	Darren Sexton	Check and verify asset utilisation measurement and its compliance with PPAs
The reasons for under-utilisation or poor performance are critically examined and corrective action or disposal undertaken	2	B	Medium	M				√			Asset management plan	Operational performance review	Darren Sexton	
Disposal alternatives are evaluated	2	B	Medium	W			√				Asset management plan, Life cycle planning	Disposal procedure	Darren Sexton	Check the content of the procedure
There is a replacement strategy for assets	2	C	Medium	M				√			Corporate evaluation strategy		Darren Sexton	Check alignment of replacement strategy with the disposal procedure
4. Environmental analysis														
Opportunities and threats in the system environment are assessed	3	C	High	S		√					Hazard register, Incident Register, Risk register	ISO14001	Darren Sexton	Check examples of HAZOP, or SWOT

Performance standards (availability of service, capacity, continuity, emergency response, etc) are measured and achieved	2	B	Medium	M				√			Monthly report including performance data, Incident register		Darren Sexton	
Compliance with statutory and regulatory requirements	3	C	High	M			√				Compliance database register, Design Safety requirements, Maintenance inspection plans		Darren Sexton	Check and verify compliance with the requirements
Achievement of customer service levels	2	C	Medium	S				√			Regular meetings with customer (Argyl), Asset Performance indicators, PPA		Darren Sexton	Verify examples of achievements of customer service levels
5. Asset operations														
Operational policies and procedures are documented and linked to service levels required	3	C	High	M			√					Standard operating procedures	Brian Walter	Check and verify procedures
Risk management is applied to prioritise operations tasks	2	C	Medium	S				√			Risk Register, AMP, resource planning	Risk management plan	Darren Sexton	Check and verify tasks are prioritized based upon risk
Assets are documented in an Asset Register including asset type, location, material, plans of components, an assessment of assets' physical/structural condition and accounting data	3	C	High	S			√				Computerised Maintenance Management System, Financial Asset register, GIS		Darren Sexton	Check and verify completeness and effectiveness of asset register
Operational costs are measured and monitored	2	B	Medium	S				√			Monthly reports, financial reports, budget plans		Darren Sexton	Check and verify operational cost are measured

Staff receive training commensurate with their responsibilities	2	B	Medium	W			√				Training matrix, Succession planning		Darren Sexton	
6. Asset maintenance														
Maintenance policies and procedures are documented and linked to service levels required	3	B	High	M			√				Maintenance planning and Scheduling, Plant Standards	Maintenance procedure, Maintenance instructions	Darren Sexton Brian Walter	
Regular inspections are undertaken of asset performance and condition	3	C	High	M			√				2-3 yearly condition audit, Task database / action plan	Weekly and monthly inspections, Maintenance planning	Darren Sexton Brian Walter	Check and verify compliance with maintenance inspection plans
Maintenance plans (emergency, corrective and preventative) are documented and completed on schedule	3	B	High	M			√				Maintenance delivery plan, Backlog management		Brian Walter	Check and verify compliance with maintenance plans
Failures are analysed and operational/maintenance plans adjusted where necessary	2	C	Medium	S				√			Updated maintenance plans		Brian Walter	Check evidence of Root Cause Analysis (RCA)
Risk management is applied to prioritise maintenance tasks	2	B	Medium	M				√			Maintenance task prioritisation process		Brian Walter	Check and verify that maintenance tasks are prioritised based on risk
Maintenance costs are measured and monitored	2	C	Medium	S				√			Monthly reports, budget plans		Darren Sexton	Check examples of the maintenance budget planning and verify maintenance costs are monitored

7. Asset Management Information System (MIS)

Adequate system documentation for users and IT operators	3	A	High	W	√						IT System Manuals, Sharepoint Manuals		Darren Sexton	No manuals exist for CMMS Check and verify contents of other manuals
Input controls include appropriate verification and validation of data entered into the system	2	B	Medium	W			√					Data validation process	Darren Sexton	Not actively managing data validation into the system
Logical security access controls appear adequate, such as passwords	2	C	Medium	S				√			Access control for SCADA, CMMS, Sharepoint	IT system policy and procedures	Darren Sexton	Check assigned access authority levels
Physical security access controls appear adequate	2	C	Medium	S				√			Access control for SCADA, CMMS, Sharepoint	IT system policy and procedures	Darren Sexton	Check and verify physical security access is appropriate
Data backup procedures appear adequate	2	C	Medium	S							Data backup process and backup history		Darren Sexton	Verify the adequacy of the process
Key computations related to licensee performance reporting are materially accurate	1	B	Low	M					√		Performance reports, review reports		Darren Sexton	Check and verify compliance
Management reports appear adequate for the licensee to monitor licence obligations	1	C	Low	S					√		Monthly report, reconciliation report to Horizon Power	3 yearly report	Darren Sexton	

8. Risk management

Risk management policies and procedures exist and are being	3	C	High	S		√					Risk policy, Risk register, asset		Darren Sexton	
---	---	---	------	---	--	---	--	--	--	--	-----------------------------------	--	---------------	--

applied to minimise internal and external risks associated with the asset management system											management plan			
Risks are documented in a risk register and treatment plans are actioned and monitored	3	B	High	M		√					Risk Register, Task Register, Review Action plans(project plans)		Darren Sexton	Check and verify that the Action plan implementation is effective
The probability and consequences of asset failure are regularly assessed	2	B	Medium	M			√				Reliability reports, failure analysis, asset life cycle and condition monitoring reports		Darren Sexton	Verify risk assessments and CMMS Data
9. Contingency planning														
Contingency plans are documented, understood and tested to confirm their operability and to cover higher risks	3	C	High	M		√					Contingency plans, staff training records, risk management system		Darren Sexton	Review the currency and effectiveness of the contingency plans
10. Financial planning														
The financial plan states the financial objectives and strategies and actions to achieve the objectives	2	C	Medium	S			√				Business plan, Asset Management Plan Capex and Opex Plan		Darren Sexton	Check and verify the contents of the plans
The financial plan identifies the source of funds for capital expenditure and recurrent costs	2	B	Medium	M			√				Business and asset management plans	Planning procedure	Darren Sexton	Process for Evaluation of sources of funds
The financial plan provides projections of operating statements (profit and loss) and statement of financial position (balance sheets)	3	C	High	S		√					Business plan, P&L reports, budget reports		Darren Sexton	

The financial plan provide firm predictions on income for the next five years and reasonable indicative predictions beyond this period	3	C	High	M			√				Business Plan		Darren Sexton	
The financial plan provides for the operations and maintenance, administration and capital expenditure requirements of the services	2	C	Medium	S				√			Business plan and Asset Management plan		Darren Sexton	
Significant variances in actual/budget income and expenses are identified and corrective action taken where necessary	2	B	Medium	M				√			Monthly reporting , Check Action Plan		Darren Sexton	
11. Capital expenditure planning														
There is a capital expenditure plan that covers issues to be addressed, actions proposed, responsibilities and dates	2	B	Medium	M				√			Project plan, Asset Management Plan, and task schedule		Darren Sexton	Check and verify the effectiveness of the capital expenditure planning process
The plan provides reasons for capital expenditure and timing of expenditure	2	C	Medium	S				√			Project plans		Darren Sexton	Review samples of the project plans
The capital expenditure plan is consistent with the asset life and condition identified in the asset management plan	1	C	Low	S					√		Project plan, Asset Management Plan, and task schedule		Darren Sexton	
There is an adequate process to ensure that the capital expenditure plan is regularly updated and actioned	1	C	Low	M					√		Annual review report		Darren Sexton	Verify updates and review records of the project plan

12. Review of AMS															
A review process is in place to ensure that the asset management plan and the asset management system described therein are kept current	2	C	Medium	S							√	Check the compliance with the annual review cycle 2 yearly licence review	Review process	Darren Sexton	PAS55 review every 2-3 years conducted internally
Independent reviews (eg internal audit) are performed of the asset management system	2	C	Medium	S							√	Check the compliance with the annual review cycle 2 yearly licence review	Review process	Darren Sexton	PAS55 review every 2-3 years conducted internally

