Alcoa of Australia Ltd

Electricity Generation Licence (EGL14)

2017 Asset Management System Review Report

December 2017

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Mr Richard Le Tessier
Principal Mechanical Engineer - WA Powerhouse Operations
Alcoa of Australia Ltd
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BOORAGOON WA 6953

15 December 2017

Dear Richard

Alcoa of Australia Ltd Electricity Generation Licence (EGL14) – 2017 Asset Management System review report

We have completed the Electricity Generation Licence Asset Management System review for Alcoa of Australia Ltd for the period 1 July 2013 to 30 June 2017 and are pleased to submit our report to you.

I confirm that this report is an accurate presentation of the findings and conclusions from our review procedures.

If you have any questions or wish to discuss anything raised in the report, please contact Andrew Baldwin on 9365 7236 or myself on 9365 7024.

Yours sincerely

Richard Thomas
Partner
Deloitte Risk Advisory Pty Ltd

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1 Independent Reviewer's report

With the approval of the Economic Regulation Authority (**ERA**), Alcoa of Australia Ltd (**Alcoa**) engaged Deloitte Risk Advisory Pty Ltd (**Deloitte**) to conduct a review of the effectiveness of Alcoa's Asset Management System (**AMS**) relating to its Electricity Generation Licence No.14 (EGL 14) (the **Licence**) for the period 1 July 2013 to 30 June 2017 (**review period**). Deloitte engaged KT & Sai Associates Pty Ltd to provide advice where technical expertise was required. Deloitte conducted the review as a limited assurance engagement.

Alcoa's responsibility for maintaining an effective AMS

Alcoa is responsible for establishing and maintaining an effective AMS for the assets subject to the License as measured by the effectiveness criteria in the Guidelines. This responsibility includes implementing and maintaining policies, procedures and controls, which are designed to provide for an effective AMS for assets subject to the Licence, as measured by the effectiveness criteria in the Guidelines.

Deloitte's responsibility

Our responsibility is to express a conclusion, based on our procedures, on the effectiveness of Alcoa's AMS for assets subject to the Licence. The limited assurance engagement has been conducted in accordance with the Australian Standard on Assurance Engagements (**ASAE**) *3500 Performance Engagements* issued by the Australian Auditing and Assurance Standards Board, in order to state whether, in all material respects, based on the work performed, anything has come to our attention to indicate that Alcoa had not established and maintained an effective AMS for assets subject to the Licence, as measured by the effectiveness criteria in the April 2014 issue of the *Audit and Review Guidelines: Electricity and Gas Licences* issued by the ERA (the **Guidelines**) and in operation during the review period.

ASAE 3500 also requires us to comply with the relevant ethical requirements of the Australian professional accounting bodies.

Our procedures consisted primarily of:

- Utilising the Guidelines as a guide for development of a risk assessment and document review to assess controls
- Development of a Review Plan for approval by the ERA and an associated work program
- Interviews with and representations from relevant Alcoa staff to gain an understanding of the development and maintenance of policies and procedural type documentation
- Examination of documented policies and procedures for key functional requirements and consideration of their relevance to Alcoa's AMS requirements and standards
- Physical visit to Alcoa's operations sites
- Consideration of reports and references evidencing activity
- Consideration of the installations' function, normal modes of operation and age
- Reporting of findings to Alcoa for review and response.

Limitations of use

This report is made solely for the information and internal use of Alcoa and is not intended to be, and should not be, used by any other person or entity. No other person or entity is entitled to rely, in any manner, or for any purpose, on this report.

We understand that a copy of the report will be provided to the ERA for the purpose of reporting on the effectiveness of Alcoa's AMS. We agree that a copy of this report may be provided to the ERA for its information in connection with this purpose but only on the basis that we accept no duty, liability or responsibility to the ERA in relation to the report. We accept no duty, responsibility or liability to any party, other than Alcoa, in connection with the report or this engagement.

Inherent limitations

A limited assurance engagement is substantially more limited in scope than a reasonable assurance engagement conducted in accordance with ASAE 3500 and consequently does not allow us to obtain assurance that we would become aware of all significant matters that might be identified in a reasonable assurance engagement. Accordingly, we will not express an opinion providing reasonable assurance.

Because of the inherent limitations of any compliance procedure, it is possible that fraud, error or non-compliance may occur and not be detected. We cannot, in practice, examine every activity and procedure, nor can we be a substitute for management's responsibility to maintain adequate controls over all levels of operations and its responsibility to prevent and detect irregularities, including fraud. Accordingly, readers of our reports should not rely on the report to identify all potential instances of AMS deficiencies, which may occur.

Any projection of the evaluation of the effectiveness of AMS processes and procedures to future periods is subject to the risk that the processes and procedures may become inadequate because of changes in conditions, or that the degree of compliance with management procedures may deteriorate.

Independence

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

Conclusion

Based on our work described in this report, in all material respects, nothing has come to our attention to indicate that Alcoa had not established and maintained an effective AMS for assets subject to the Licence, as measured by the effectiveness criteria in the Guidelines and in operation during the period 1 July 2013 to 30 June 2017.

Table 3 of this report provides the effectiveness ratings for each of the 12 key processes in the asset management lifecycle assessed by this engagement. For those aspects of Alcoa's AMS that were assessed as having opportunities for improvement, relevant observations, recommendations and action plans are summarised at section 2.4 of this report and detailed at section 4 of this report.

DELOITTE RISK ADVISORY PTY LTD

Richard Thomas
Partner
Perth, 15 December 2017

2 Executive summary

2.1 Introduction and background

The Economic Regulation Authority (the **ERA**) has, under the provisions of the Electricity Industry Act 2004 (**Electricity Act**), issued to Alcoa of Australia Ltd (**Alcoa**) the Electricity Generation Licence No.14 (EGL14) (the **Licence**).

Section 14 of the Act requires Alcoa to provide to the ERA an asset management system (**AMS**) review (the **review**) conducted by an independent expert acceptable to the ERA not less than once in every 24 month period (or any longer period that the ERA allows). The ERA set the period to be covered by the review as 1 July 2013 to 30 June 2017 (**review period**). At the request of Alcoa, Deloitte Risk Advisory Pty Ltd (**Deloitte**) has undertaken a limited assurance review of Alcoa's AMS.

The Licence relates to Alcoa's operation of generating works at its Kwinana, Pinjarra and Wagerup facilities. These works are managed by Alcoa's WA powerhouse operations within the WA Operations (**WAO**) business unit. When the licence was first granted to Alcoa, it was anticipated Alcoa's net inflow and outflow would net to nil. Alcoa is now a net importer of electricity owing to increased consumption, predominately related to refinery and mining activity at its Pinjarra facility.

The review has been conducted in accordance with the April 2014 issue of the *Audit and Review Guidelines: Electricity and Gas Licences* (the **Guidelines**), which sets out 12 key processes in the asset management lifecycle. The limited assurance review was undertaken in order to state whether, based on the work performed, in all material respects, anything has come to our attention to indicate that Alcoa had not established and maintained an effective AMS for assets subject to the Licence, as measured by the effectiveness criteria in the Guidelines and in operation during the period 1 July 2013 to 30 June 2017.

2.2 Findings

In considering Alcoa's internal control procedures, structure and environment, its compliance arrangements and its information systems specifically relevant to those effectiveness criteria subject to review, we observed that Alcoa:

- Has an established asset management framework in place, which has been subject to minimal change during the review period
- Utilises a suite of policies and procedures (which align with the Review Guidelines and ISO Standards) as well as an enterprise Asset Management system (**eAM system**) to facilitate its operations
- Leverages experienced and long-serving staff, who:
    - Demonstrate a sound understanding of effective asset management principles
    - Possess a strong appetite for reporting and accountability.
- Utilises data and dashboard reporting (through the Equipment Management Metrics (**EMM**) portal) to identify trends in asset condition and maintenance performance
- Has a small number of further opportunities to strengthen aspects of its AMS, as described in this report.

This review assessed that, of the 56 elements of Alcoa's AMS:

- For the asset management process and policy definition adequacy ratings:
  - 52 are rated as "Adequately defined"
  - Four are rated as "Requires some improvement".
- For the asset management performance ratings:
  - 53 are rated as "Performing effectively"
  - Three are rated as "Opportunity for improvement".
- In aggregate, there are six observations (including one outstanding observation from the 2013 AMS Review) where further action is recommended.

Specific assessments for each criterion are summarised at **Table 3** in section 3 "Summary of ratings" of this report.

Detailed findings, including relevant observations, recommendations and action plans are located in section 4 "Detailed findings, recommendations and action plans" of this report.

2.3 Alcoa's response to previous review recommendations

This review considered how Alcoa has progressed against the five outstanding action items from the 2013 review, which include two actions from the 2010 review.

Based on our examination of relevant documents, discussion with staff and consideration of the results of this review's testing against the criteria, Alcoa:

- Has closed out four of the five action plans
- Is yet to complete one action plan relating to aligning its risk policies and procedures with the revised risk management standard (refer to finding 3/2013 in section 2.4 Recommendations and action plans.)

Refer to section 5 of this report for further detail.

2.4 Recommendations and action plans

A. Resolved at end of current review period

Not applicable.

B. Unresolved at end of current review period

<table>
<tr><th>AMS Key Process and Effectiveness Criteria</th><th>Adequacy rating</th><th>Issue 1/2017</th></tr>
<tr><td rowspan="3">Asset Planning
1(a) Asset management plan covers key requirements</td><td>Requires some improvement (B)</td><td rowspan="3">Alcoa has developed a Powerhouse Asset Strategy for each of its Kwinana, Pinjarra and Wagerup Powerhouses, which serves as the overarching asset management plan for each of Alcoa’s generation sites under the Licence.
Those Powerhouse Asset Strategies provide for diesel as an alternative fuel in the event of a shortage of gas. However,
• We are advised that Alcoa has modified its strategy for testing its capacity to changeover from gas to diesel firing. That strategy is not reflected in the Powerhouse Asset Strategies
• A diesel shelf-life monitoring program has not yet been established to outline Alcoa’s requirements for managing/regularly testing diesel and monitoring diesel shelf-life.
The consequential impact of Alcoa’s current approach to diesel use not being reflected in its Powerhouse Asset Strategies includes outdated:
• Maintenance activities. For example, a planned maintenance task to conduct routine Boiler Oil burns at the Kwinana powerhouse was listed as long overdue at 30 June 2017
• Contingency Plans.</td></tr>
<tr><td>Performance rating</td></tr>
<tr><td>Opportunity for improvement (2)</td></tr>
<tr><td colspan="2">Recommendation 1/2017
Alcoa:
(a) Update its Powerhouse Asset Strategies to reflect its current approach to diesel management and use
(b) Implement a relevant diesel shelf-life monitoring program.</td><td>Action Plan 1/2017
Alcoa will:
(a) Update its Powerhouse Asset Strategies to reflect its current approach to diesel management and use
(b) Implement a relevant diesel shelf-life monitoring program.
Responsible Person
Principal Mechanical Engineer WAO Powerhouse
Target Date:
30 June 2018</td></tr>
</table>

<table>
<tr><th>AMS Key Process and Effectiveness Criteria</th><th>Adequacy rating</th><th>Issue 2/2017</th></tr>
<tr><td rowspan="3">Asset Planning
1(i) Plans are regularly reviewed and updated</td><td>Requires some improvement (B)</td><td rowspan="3">Alcoa’s Kwinana Powerhouse Asset Strategy provides for the strategy to be reviewed every two years. As the last review was performed in February 2015, the current review is overdue.
The Principal Mechanical Engineer WAO Powerhouse advised that Alcoa has reconsidered the appropriateness of the timeframe for reviewing the Kwinana Powerhouse Asset Strategy, to better align with the review timeframe applied to the Wagerup and Pinjarra Powerhouse Asset Strategies (every four and five years respectively).</td></tr>
<tr><td>Performance rating</td></tr>
<tr><td>Performing effectively (1)</td></tr>
<tr><td colspan="2">Recommendation 2/2017
Alcoa formally assess and, where necessary, amend the timeframe for reviewing its Powerhouse Asset Strategies.</td><td>Action Plan 2/2017
Alcoa will formally assess and, where necessary, amend the timeframe for reviewing its Powerhouse Asset Strategies.
Responsible Person
Principal Mechanical Engineer WAO Powerhouse
Target Date
30 June 2018</td></tr>
</table>

<table>
<tr><th>AMS Key Process and Effectiveness Criteria</th><th>Adequacy rating</th><th>Issue 3/2017</th></tr>
<tr><td rowspan="3">Asset Maintenance
6(c) Maintenance plans (emergency, corrective and preventative) are documented and completed on schedule</td><td>Adequately defined (A)</td><td rowspan="3">Alcoa’s prioritisation of maintenance work orders is based on its operational requirements (e.g. emergency and corrective works having higher priority), its statutory obligations and designation of critical assets.
Its EMMS portal also provides a strong capability for monitoring performance metrics such as the ‘Late Critical Compliance %’ metric, which reports details of overdue work orders relating to critical assets. The Principal Mechanical Engineer WAO Powerhouse also advised of Alcoa’s intention to leverage its data and reporting capabilities to drive further maintenance efficiencies, which demonstrates a focus on continuous improvement in its approach to maintenance.
We recognise that Alcoa’s work order planning and monitoring processes are driven by experienced staff/managers who are responsible for maintaining powerhouse reliability, however those processes can be further improved with more structured guidance on the relevant priority of maintenance tasks. By further distinguishing between lower and higher priority tasks, Alcoa will be better placed to complete the most critical maintenance within the required timeframes and to further improve efficiencies by minimising investment in lowest priority work orders.</td></tr>
<tr><td>Performance rating</td></tr>
<tr><td>Opportunity for improvement (2)</td></tr>
<tr><td colspan="2">Recommendation 3/2017
Alcoa:
(a) Investigate the capability of its work order planning and monitoring processes to introduce a further degree of work order prioritisation
(b) Consider the potential to further rationalise the number of maintenance tasks assigned as critical (i.e. to re-assign with a lower priority).</td><td>Action Plan 3/2017
Alcoa will:
(a) Investigate the capability of its work order planning and monitoring processes to introduce a further degree of work order prioritisation
(b) Consider the potential to further rationalise the number of maintenance tasks assigned as critical (i.e. to re-assign with a lower priority).
Responsible Person
Principal Mechanical Engineer WAO Powerhouse
Target Date:
30 June 2018</td></tr>
</table>

AMS Key Process and Effectiveness Criteria	Adequacy rating	Issue 4/2017
Contingency Planning *9(a) Contingency plans are documented, understood and tested to confirm their operability and to cover higher risks*	Requires some improvement (B) **Performance rating** Performing Effectively (1)	Alcoa maintains Emergency Response Procedures (**ERP**s) for each refinery as a component of its suite of policies and procedures for contingency management. We observed evidence of mock emergency response activities performed as part of refinery ERPs, and subject to review via ASAT audits. However Alcoa has not applied a coordinated approach to ensure its ERPs capture Alcoa's requirements for the method and frequency of test procedures.
Recommendation 4/2017 Alcoa update its ERPs to provide for: • Frequency of testing • Method of testing • Required documentation/reporting outputs • A lessons learned mechanism.		**Action Plan 4/2017** Alcoa will update its ERPs to provide for: • Frequency of testing • Method of testing • Required documentation/reporting outputs • A lessons learned mechanism. **Responsible Person** Principal Mechanical Engineer WAO Powerhouse **Target Date** 30 June 2018

AMS Key Process and Effectiveness Criteria	Adequacy rating	Issue 5/2017
Review of Asset Management System *12(b) Independent reviews (e.g. internal audit) are performed of the asset management system.*	Adequately defined (A) **Performance rating** Opportunity for improvement (2)	Alcoa had established a program for Alcoa Self-Assessment Test (**ASAT**) audits on its Powerhouse AMS to be performed every three years by the Alcoa internal audit team. The last scheduled ASAT audit was to be performed in 2014, however that audit was not undertaken. Although elements of Alcoa's AMS are subject to forms of monitoring and review (such as health and safety system reviews, licence compliance monitoring), those activities are not consolidated and recognised as part of an effective independent review of its Powerhouse AMS.
Recommendation 5/2017 Alcoa: (a) Reassess the relevance, scope and frequency of ASAT audits on its Powerhouse AMS (b) Commit to either completing an ASAT audit, or to another suitable form of independent review of its Powerhouse AMS (c) Document its approach to independent review of its Powerhouse AMS.		**Action Plan 5/2017** Alcoa will: (a) Reassess the relevance, scope and frequency of ASAT audits on its Powerhouse AMS (b) Commit to either completing an ASAT audit, or to another suitable form of independent review of its Powerhouse AMS (c) Document its approach to independent review of its Powerhouse AMS. **Responsible Person** Principal Mechanical Engineer WAO Powerhouse **Target Date** 30 June 2018

The following issue has carried over from the 2013 AMS review.

<table>
<tr><th>AMS Key Process and Effectiveness Criteria</th><th>Adequacy rating</th><th>Issue 3/2013</th></tr>
<tr><td rowspan="3">Risk Management
8(a) Risk management policies and procedures exist and are being applied to minimise internal and external risks associated with the asset management system.</td><td>Requires some improvement (B)</td><td rowspan="3">2013 AMS review report finding
We observed evidence of risk management activities being applied to WAO Powerhouse planning and management activities.
However, as a minor point to note, Alcoa’s suite of risk management policies and procedures refers to the out-dated Risk Management Australian standard AS/NZS 4360:2004. The new risk management standard AS/NZS ISO 31000:2009, although not fundamentally different to the old standard, has been updated including a new definition of risk and provides a greater emphasis on how risk management should be implemented and integrated into an organisation.
Current status
At the time of this review, the Action Plan had not been completed by the 30 June 2014 target date. Therefore, the finding remains relevant to the current review period.</td></tr>
<tr><td>Performance rating</td></tr>
<tr><td>Performing Effectively (1)</td></tr>
<tr><td colspan="2">Recommendation 3/2013 (per 2013 AMS review report)
Alcoa update the Risk Management suite of documents to reflect the revised Risk Management standard AS/NZS ISO 31000:2009.</td><td>Action Plan 3/2013
Alcoa will update its risk management suite of documentation to reflect the revised Risk Management standard.
Responsible Person
Principal Mechanical Engineer WAO Powerhouse
Target Date:
30 June 2018</td></tr>
</table>

2.5 Scope and objectives

In accordance with the Review Guidelines, the review considered the effectiveness of Alcoa's existing control procedures within the 12 key processes in the asset management lifecycle as outlined below at Table 1.

Table 1 – AMS key processes and effectiveness criteria

#	Key process	Effectiveness criteria
1	Asset planning	(a) Asset management plan covers key requirements (b) Planning process and objectives reflect the needs of all stakeholders and is integrated with business planning (c) Service levels are defined (d) Non-asset options (e.g. demand management) are considered (e) Lifecycle costs of owning and operating assets are assessed (f) Funding options are evaluated (g) Costs are justified and cost drivers identified (h) Likelihood and consequences of asset failure are predicted (i) Plans are regularly reviewed and updated.
2	Asset creation and acquisition	(a) Full project evaluations are undertaken for new assets, including comparative assessment of non-asset solutions (b) Evaluations include all lifecycle costs (c) Projects reflect sound engineering and business decisions (d) Commissioning tests are documented and completed (e) Ongoing legal/environmental/safety obligations of the asset owner are assigned and understood.
3	Asset disposal	(a) Under-utilised and under-performing assets are identified as part of a regular systematic review process (b) The reasons for under-utilisation or poor performance are critically examined and corrective action or disposal undertaken (c) Disposal alternatives are evaluated (d) There is a replacement strategy for assets.
4	Environmental analysis (all external factors that affect the system)	(a) Opportunities and threats in the system environment are assessed (b) Performance standards (availability of service, capacity, continuity, emergency response, etc.) are measured and achieved (c) Compliance with statutory and regulatory requirements (d) Achievement of customer service levels.
5	Asset operations	(a) Operational policies and procedures are documented and linked to service levels required (b) Risk management is applied to prioritise operations tasks (c) 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 (d) Operational costs are measured and monitored (e) Staff resources are adequate and staff receive training commensurate with their responsibilities.

#	Key process	Effectiveness criteria
6	Asset maintenance	(a) Maintenance policies and procedures are documented and linked to service levels required (b) Regular inspections are undertaken of asset performance and condition (c) Maintenance plans (emergency, corrective and preventative) are documented and completed on schedule (d) Failures are analysed and operational/maintenance plans adjusted where necessary (e) Risk management is applied to prioritise maintenance tasks (f) Maintenance costs are measured and monitored.
7	Asset management information system	(a) Adequate system documentation exists for users and IT operators (b) Input controls include appropriate verification and validation of data entered into the system (c) Logical security access controls appear adequate, such as passwords (d) Physical security access controls appear adequate (e) Data backup procedures appear adequate and backups are tested (f) Key computations related to licensee performance reporting are materially accurate (g) Management reports appear adequate for the licensee to monitor licence obligations.
8	Risk management	(a) Risk management policies and procedures exist and are being applied to minimise internal and external risks associated with the asset management system (b) Risks are documented in a risk register and treatment plans are actioned and monitored (c) The probability and consequences of asset failure are regularly assessed.
9	Contingency planning	(a) Contingency plans are documented, understood and tested to confirm their operability and to cover higher risks.
10	Financial planning	(a) The financial plan states the financial objectives and strategies and actions to achieve the objectives (b) The financial plan identifies the source of funds for capital expenditure and recurrent costs (c) The financial plan provides projections of operating statements (profit and loss) and statement of financial position (balance sheets) (d) The financial plan provides firm predictions on income for the next five years and reasonable indicative predictions beyond this period (e) The financial plan provides for the operations and maintenance, administration and capital expenditure requirements of the services (f) Significant variances in actual/budget income and expenses are identified and corrective action taken where necessary.

#	Key process	Effectiveness criteria
11	Capital expenditure planning	(a) There is a capital expenditure plan that covers issues to be addressed, actions proposed, responsibilities and dates (b) The plan provides reasons for capital expenditure and timing of expenditure (c) The capital expenditure plan is consistent with the asset life and condition identified in the asset management plan (d) There is an adequate process to ensure that the capital expenditure plan is regularly updated and actioned.
12	Review of Asset Management System	(a) A review process is in place to ensure that the asset management plan and the asset management system described therein are kept current (b) Independent reviews (e.g. internal audit) are performed of the asset management system.

Each key process and effectiveness criterion is applicable to Alcoa's Licence and as such was individually considered as part of the review. The Review Plan set out at Appendix A details the risk assessments made for and priority assigned to each key process and effectiveness criterion.

2.6 Approach

Our approach for this review involved the following activities, which were undertaken during the period October to early November 2017:

- Utilising the Guidelines, development of a risk assessment, which involved discussions with key staff and review of documents to undertake a preliminary assessment of relevant controls
- Development of a Review Plan (see **Appendix A**) for approval by the ERA
- Correspondence and interviews with Alcoa staff to gain understanding of process controls in place (see **Appendix B** for staff involved)
- Visited Alcoa's Pinjarra and Kwinana powerhouse sites with a focus on understanding the relevant facility, its function and normal mode of operation, its age and an assessment of the facility against the AMS review criteria
- Review of documents, processes and controls to assess the overall effectiveness of Alcoa's AMS (see **Appendix B** for reference listing)
- Consideration of the resourcing applied to maintaining those controls and processes
- Reporting of findings to Alcoa for review and response.

2.7 Inherent limitations

A limited assurance engagement is substantially more limited in scope than a reasonable assurance engagement conducted in accordance with ASAE 3500 and consequently does not allow us to obtain assurance that we would become aware of all significant matters that might be identified in a reasonable assurance engagement. Accordingly, we will not express an opinion providing reasonable assurance.

Because of the inherent limitations of any compliance procedure, it is possible that fraud, error or non-compliance may occur and not be detected. We cannot, in practice, examine every activity and procedure, nor can we be a substitute for management's responsibility to maintain adequate controls over all levels of operations and its responsibility to prevent and detect irregularities, including fraud. Accordingly, readers of our reports should not rely on the report to identify all potential instances of non-compliance which may occur.

Any projection of the evaluation of the effectiveness of AMS processes and procedures to future periods is subject to the risk that the processes and procedures may become inadequate because of changes in conditions, or that the degree of compliance with management procedures may deteriorate.

3 Summary of ratings

In accordance with the Guidelines, the assessment of both the process and policy definition adequacy rating (refer to **Table 1**) and the performance rating (refer to **Table 2**) for each of the key AMS processes is performed using the below ratings.

For the avoidance of doubt, these ratings do not provide reasonable assurance.

Table 1: Asset management process and policy definition adequacy ratings

Rating	Description	Criteria
A	Adequately defined	• 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	• 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	• 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	• 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 2: Asset management performance ratings

Rating	Description	Criteria
1	Performing effectively	• 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	• The performance of the process requires some improvement to meet the required level • Process effectiveness reviews are not performed regularly enough. • Process improvement opportunities are not actioned.
3	Corrective action required	• 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	• Process is not performed, or the performance is so poor that the process is considered to be ineffective.

This report provides:

- A breakdown of each function of the AMS into sub-components as described in the Guidelines. This approach is taken to enable a more thorough review of key processes where individual components within a larger process can be of greater risk to the business therefore requiring different review treatment
- A summary of the ratings applied by the review (**Table 3**) for each of:
  - Asset management process and policy definition adequacy (**definition adequacy rating**)
  - Asset management performance (**performance rating**)
- Detailed findings, including relevant observations, recommendations and action plans (**Section 4**). Descriptions of the effectiveness criteria can be found in section 4 and the Review Plan at Appendix A.

Table 3: AMS effectiveness summary

			Ratings	
Ref	Effectiveness criteria	Review Priority	Definition adequacy	Performance
1. Asset planning			**B**	**1**
1(a)	Asset management plan covers key requirements	Priority 4	B	2
1(b)	Planning process and objectives reflect the needs of all stakeholders and is integrated with business planning	Priority 5	A	1
1(c)	Service levels are defined	Priority 5	A	1
1(d)	Non-asset options (e.g. demand management) are considered	Priority 5	A	1
1(e)	Lifecycle costs of owning and operating assets are assessed	Priority 4	A	1
1(f)	Funding options are evaluated	Priority 5	A	1
1(g)	Costs are justified and cost drivers identified	Priority 4	A	1
1(h)	Likelihood and consequences of asset failure are predicted	Priority 2	A	1
1(i)	Plans are regularly reviewed and updated	Priority 5	B	1
2. Asset creation and acquisition			**A**	**1**
2(a)	Full project evaluations are undertaken for new assets, including comparative assessment of non-asset solutions	Priority 4	A	1
2(b)	Evaluations include all life-cycle costs	Priority 4	A	1
2(c)	Projects reflect sound engineering and business decisions	Priority 4	A	1
2(d)	Commissioning tests are documented and completed	Priority 4	A	1
2(e)	Ongoing legal/environmental/safety obligations of the asset owner are assigned and understood	Priority 2	A	1
3. Asset disposal			**A**	**1**
3(a)	Under-utilised and under-performing assets are identified as part of a regular systematic review process	Priority 5	A	1
3(b)	The reasons for under-utilisation or poor performance are critically examined and corrective action or disposal undertaken	Priority 5	A	1
3(c)	Disposal alternatives are evaluated	Priority 5	A	1
3(d)	There is a replacement strategy for assets	Priority 3	A	1
4. Environmental analysis			**A**	**1**
4(a)	Opportunities and threats in the system environment are assessed	Priority 4	A	1
4(b)	Performance standards (availability of service, capacity, continuity, emergency response, etc.) are measured and achieved	Priority 4	A	1
4(c)	Compliance with statutory and regulatory requirements	Priority 4	A	1
4(d)	Achievement of customer service levels	Priority 4	A	1
5. Asset operations			**A**	**1**
5(a)	Operational policies and procedures are documented and linked to service levels required	Priority 4	A	1
5(b)	Risk management is applied to prioritise operations tasks	Priority 4	A	1
5(c)	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	Priority 4	A	1

Ref	Effectiveness criteria	Review Priority	Ratings	
			Definition adequacy	Performance
5(d)	Operational costs are measured and monitored	Priority 4	A	1
5(e)	Staff resources are adequate and staff receive training commensurate with their responsibilities	Priority 4	A	1
6. Asset maintenance			**A**	**1**
6(a)	Maintenance policies and procedures are documented and linked to service levels required	Priority 3	A	1
6(b)	Regular inspections are undertaken of asset performance and condition	Priority 2	A	1
6(c)	Maintenance plans (emergency, corrective and preventative) are documented and completed on schedule	Priority 2	A	2
6(d)	Failures are analysed and operational/maintenance plans adjusted where necessary	Priority 2	A	1
6(e)	Risk management is applied to prioritise maintenance tasks	Priority 2	A	1
6(f)	Maintenance costs are measured and monitored	Priority 4	A	1
7. Asset management information system			**A**	**1**
7(a)	Adequate system documentation exists for users and IT operators	Priority 5	A	1
7(b)	Input controls include appropriate verification and validation of data entered into the system	Priority 5	A	1
7(c)	Logical security access controls appear adequate, such as passwords	Priority 5	A	1
7(d)	Physical security access controls appear adequate	Priority 5	A	1
7(e)	Data backup procedures appear adequate and backups are tested	Priority 4	A	1
7(f)	Key computations related to licensee performance reporting are materially accurate	Priority 5	NR	NR
7(g)	Management reports appear adequate for the licensee to monitor licence obligations	Priority 5	A	1
8. Risk management			**A**	**1**
8(a)	Risk management policies and procedures exist and are being applied to minimise internal and external risks associated with the AMS	Priority 2	B	1
8(b)	Risks are documented in a risk register and treatment plans are actioned and monitored	Priority 4	A	1
8(c)	The probability and consequences of asset failure are regularly assessed	Priority 2	A	1
9. Contingency planning			**B**	**1**
9(a)	Contingency plans are documented, understood and tested to confirm their operability and to cover higher risks	Priority 2	B	1
10. Financial planning			**A**	**1**
10(a)	The financial plan states the financial objectives and strategies and actions to achieve the objectives	Priority 5	A	1
10(b)	The financial plan identifies the source of funds for capital expenditure and recurrent costs	Priority 5	A	1
10(c)	The financial plan provides projections of operating statements (profit and loss) and statement of financial position (balance sheets)	Priority 5	A	1
10(d)	The financial plan provide firm predictions on income for the next five years and reasonable indicative predictions beyond this period	Priority 5	A	1
10(e)	The financial plan provides for the operations and maintenance, administration and capital expenditure requirements of the services	Priority 5	A	1
10(f)	Significant variances in actual/budget income and expenses are identified and corrective action taken where necessary	Priority 5	A	1
11. Capital expenditure planning			**A**	**1**
11(a)	There is a capital expenditure plan that covers issues to be addressed, actions proposed, responsibilities and dates	Priority 5	A	1
11(b)	The plan provides reasons for capital expenditure and timing of expenditure	Priority 5	A	1
11(c)	The capital expenditure plan is consistent with the asset life and condition identified in the asset management plan	Priority 3	A	1
11(d)	There is an adequate process to ensure that the capital expenditure plan is regularly updated and actioned	Priority 5	A	1
12. Review of AMS			**A**	**2**
12(a)	A review process is in place to ensure that the asset management plan and the AMS described therein are kept current	Priority 5	A	1
12(b)	Independent reviews (e.g. internal audit) are performed of the AMS	Priority 5	A	2

4 Detailed findings, recommendations and action plans

Summary of operations subject to review

Kwinana Powerhouse

The Alcoa Kwinana plant is located within Alcoa's Alumina Refinery Facilities at Kwinana. The plant comprises six generators, five of which were commissioned between 1962 and 1976 with the sixth in 1998. Key details relating to Alcoa's Kwinana operations are:

- The six generators have a total installed generation capacity of 66MW
- The Kwinana Powerhouse has eight boilers, which produce steam for use in the refinery process. The boilers produce 770 tonnes of steam per hour. Boilers were installed between 1962 and 1976
- Under normal operating circumstances with the refinery and all major equipment in operation, the refinery is expected to import approximately 8MW of power from a Western Power tie transformer. The Kwinana Powerhouse supplies an average of 59MW to the Refinery. Total refinery use is approximately 67MW. The tie transformer 27MVA is supplied from a Western Power 132kV switchyard
- Major items of equipment are approaching the end of normal design life. Management, refurbishment and replacement of equipment at end of life are an important consideration for Alcoa Kwinana. Alcoa Kwinana's major expenditure forecasts and 5 year plan demonstrate that these issues are being considered by management and there are a number of projects for replacing equipment that have been identified.

A loss of Alcoa's generation capability has the following effect:

- Loss of Kwinana Powerhouse generation capacity or steam capacity may directly impact refinery production. Because the cost impact of lost production is significant, Alcoa demands high availability and reliability of major steam and electrical equipment
- In the event that Kwinana Powerhouse equipment fails and electricity supply from the grid is inadequate, then Alcoa's Kwinana operations are impacted. There is no impact on the external grid.

Pinjarra Powerhouse

The Alcoa Pinjarra plant is located within Alcoa's Alumina Refinery Facilities at Pinjarra. The plant is comprised of four generators, which were commissioned between 1971 and 1977. Key details relating to Alcoa's Pinjarra operations are:

- Turbo Alternator (TA) units two, three and four each have a generation capacity of 20MW. Unit five (TA#5) has a generating capacity of 38.5MW
- The Alcoa Pinjarra Powerhouse has six boilers and additional steam is supplied from the Alinta Cogeneration units. The boilers produce steam for use in the refinery process
- Under normal operating circumstances, with the refinery and all major equipment in operation, the refinery is expected to import approximately 25MW of power from two Western Power tie transformers. The tie transformers operate in parallel, supplied from the Western Power Pinjarra 132kV switchyard

- Major items of equipment are approaching the end of normal design life. Management, refurbishment and replacement of equipment at end of life is an important consideration for Alcoa Pinjarra.

A loss of Alcoa's generation capability has the following effect:

- May directly impact refinery production. As the cost impact of lost production is significant, Alcoa demands high availability and reliability of major steam and electrical equipment
- In the event that Pinjarra Powerhouse equipment fails and electricity supply from the grid is inadequate, Alcoa's Pinjarra operations are impacted. There is no impact on the external grid.

Wagerup Powerhouse

The Alcoa Wagerup plant is located within Alcoa's Alumina Refinery Facilities at Wagerup. The plant comprises three steam turbine generators, which were commissioned between 1981 and 1992. Key details relating to Alcoa's Wagerup operations are:

- Units two (TA#2) and three (TA#3) each have a generation capacity of 18MW. Unit one (TA#1) has a generating capacity of 25MW
- The Alcoa Wagerup Powerhouse has three Babcock boilers. The boilers produce steam for generating power through steam turbines and for use in the refinery process. Boilers were installed between 1981 and 1992. A gas turbine with Heat Recovery Steam Generator, rated at 38MW was installed in 1998
- Under normal operating circumstances with the refinery and all major equipment in operation, the refinery is expected to export approximately 24MW of power via a single Western Power tie transformer. The tie transformer is connected to the Western Power Wagerup 132kV switchyard
- Major items of equipment are mid-life. Asset management and maintenance strategies are an important consideration for Alcoa Wagerup.

A loss of Alcoa's generation capability has the following effect:

- May directly impact refinery production. As the cost impact of lost production is significant, Alcoa demands high availability and reliability of major steam and electrical equipment
- In the event that Alcoa Wagerup equipment fails, and electricity supply from the grid is inadequate, then Alcoa's Wagerup operations are impacted. There is a potential loss of approximately 24MW generation on the external grid.

The following tables contain:

- *Findings*: the reviewer's understanding of the process and any issues that have been identified during the review
- *Recommendations (where applicable)*: recommendations for improvement or enhancement of the process or control
- *Action plans (where applicable)*: Alcoa's formal response to review recommendations, providing details of action to be implemented to address the specific issue raised by the review.

4.1 Asset planning

Key process: Asset planning strategies are focused on meeting customer needs in the most effective and efficient manner (delivering the right service at the right price)

Expected outcome: Integration of asset strategies into operational or business plans will establish a framework for existing and new assets to be effectively utilised and their service potential optimised

Overall Adequacy/Performance rating: Requires some improvement (B) / Performing effectively (1)

<table>
<tr><th>No</th><th>Effectiveness Criteria</th><th colspan="2">Findings</th></tr>
<tr><td rowspan="3">1(a)</td><td rowspan="2">Asset management plan covers key requirements</td><td colspan="2">Through discussion with the Principal Mechanical Engineer WAO Powerhouse and examination of Alcoa's asset management strategies and supporting policies and procedures we determined that:
• Alcoa has implemented a Powerhouse Asset Strategy for each of the Kwinana, Pinjarra and Wagerup sites (Asset Strategies), which consider the following (non-exhaustive):
○ The 12 key processes of Asset Management (as set out in the Review Guidelines)
○ Major equipment history and nameplate capacity
○ Maintenance strategy
○ Asset replacement
○ Staff training requirements.
• Alcoa's Asset Strategies provide for diesel as an alternate fuel in the event of a shortage of gas. However,
○ We are advised that Alcoa has modified its strategy for testing its capacity to changeover from gas to diesel firing. That strategy is not reflected in the Powerhouse Asset Strategies
○ A diesel shelf-life monitoring program has not yet been established to outline Alcoa's requirements for managing/regularly testing diesel and monitoring diesel shelf-life.
• The consequential impact of Alcoa's current approach to diesel use not being reflected in its Powerhouse Asset Strategies includes outdated:
○ Maintenance activities. For example, a planned maintenance task to conduct routine boiler oil burns at the Kwinana powerhouse was listed as long overdue at 30 June 2017
○ Contingency plans.</td></tr>
<tr><td>Adequacy Rating: Requires some improvement (B)</td><td>Performance Rating: Opportunity for improvement (2)</td></tr>
<tr><td colspan="2">Recommendation 1/2017
Alcoa:
(a) Update its Powerhouse Asset Strategies to reflect its current approach to diesel management and use
(b) Implement a relevant diesel shelf-life monitoring program.</td><td>Action Plan 1/2017
Alcoa will:
(a) Update its Powerhouse Asset Strategies to reflect its current approach to diesel management and use
(b) Implement a relevant diesel shelf-life monitoring program.
Responsible Person
Principal Mechanical Engineer WAO Powerhouse
Target Date
30 June 2018</td></tr>
</table>

No	Effectiveness Criteria	Findings	
1(b)	Planning process and objectives reflect the needs of all stakeholders and is integrated with business planning	Through discussion with the Principal Mechanical Engineer WAO Powerhouse and examination of the Asset Strategies for the Wagerup, Kwinana and Pinjarra powerhouses and relevant documentation relating to Alcoa's planning processes, we determined that: • Strategic planning is undertaken at the WA Operations business unit level with a three to five year outlook. The aim of business planning is to develop long term strategies and operational plans aligned to Alcoa's vision, mission and corporate business goals • The three year strategic operational plan is cascaded down to individual sites and their operational centres and departments to facilitate site planning • Powerhouse supervisors at each site are responsible for developing an operational plan with the input of engineering, operational and maintenance staff. Specifically a shutdown planner is prepared to reflect planned outages for up to 10 years in advance.	
		Adequacy Rating: Adequately defined (A)	**Performance Rating:** Performing effectively (1)
1(c)	Service levels are defined	Through discussion with the Principal Mechanical Engineer WAO Powerhouse and Project Manager – Project Delivery Wagerup and examination of Alcoa's planning documentation, we determined that: • The Western Australian management group determines refinery targets for the coming year, which in turn sets the service levels for each of the powerhouses. The plans and targets require approval from Australian operations management and ultimately Alcoa's global management • Asset Strategies specify the required service levels of the respective powerhouse assets, including detail for the planning aspects of the respective powerhouse assets e.g. production capacity, historical results.	
		Adequacy Rating: Adequately defined (A)	**Performance Rating:** Performing effectively (1)
1(d)	Non-asset options (e.g. demand management) are considered	Through discussion with the Principal Mechanical Engineer WAO Powerhouse and Project Manager – Project Delivery Wagerup and examination of the asset strategy for each of Alcoa's powerhouses and consideration of Alcoa's planning processes, we determined that: • Alcoa has developed an Expenditure Approval Policy and Procedure, which outline the requirements for project evaluations to be undertaken when a project is deemed to have measurable financial benefits to Alcoa's business • Alcoa's processes provide for new projects to be evaluated against a range of considerations such as timeframe, environmental considerations, asset alternatives, approval requirements, financial and capital requirements by means of the Request for Authorisation (**RfA**), which is supported by an economic evaluation model for opportunity cost analysis • It is a formal requirement for non-asset options to be considered when purchasing powerhouse assets • While Alcoa's asset strategies consider the option of demand management, owing to the importance of Alcoa's refinery operations, Alcoa will usually opt for an asset-based solution either through purchase, lease or a commercial arrangement with a third party if required.	
		Adequacy Rating: Adequately defined (A)	**Performance Rating:** Performing effectively (1)

<table>
<tr><th>No</th><th>Effectiveness Criteria</th><th colspan="2">Findings</th></tr>
<tr><td>1(e)</td><td>Lifecycle costs of owning and operating assets are assessed</td><td colspan="2">Through discussion with the Principal Mechanical Engineer WAO Powerhouse and Project Manager – Project Delivery Wagerup and examination of the Expenditure Approval Policy and Procedure, RfA template and economic evaluation model, we determined that:
Lifecycle costs of owning and operating assets are assessed as part of the RfA process supported by the economic evaluation template, which draws from the economic evaluation model
The economic evaluation template utilises a set of economic assumptions that are reviewed and published by Alcoa on a quarterly basis. The economic measures considered within the evaluation model include Internal Rate of Return (IRR), Net Present Value (NPV) and discounted payback period
Project evaluations incorporated a wide range of operational aspects by obtaining input from engineering and finance as well as environmental and health and safety personnel.
We examined a RfA for overhaul of a boiler at Pinjarra powerhouse and noted that the project evaluation for the scheduled overhaul identified and assessed all lifecycle costs, including planning, pre-works, procurement of parts and materials, specialist labour and electrical costs.</td></tr>
<tr><td></td><td></td><td>Adequacy Rating: Adequately defined (A)</td><td>Performance Rating: Performing effectively (1)</td></tr>
<tr><td>1(f)</td><td>Funding options are evaluated</td><td colspan="2">Through discussion with the Principal Mechanical Engineer WAO Powerhouse and Project Manager – Project Delivery Wagerup and consideration of Alcoa’s planning and expenditure authorisation processes, we determined that:
Funding options are evaluated by means of the RfA template, supported by a formal process of funds authorisation that requires selection and completion of appropriate documentation for request of funds
The RfA template and associated approval documents are required to outline the source of funds prior to submission for authorisation, as either Alcoa capital expenditure or partner share (e.g. joint venture)
The approver of funds is responsible for ensuring that the most economical (lowest total cost/best fit for purpose) alternative has been selected, or there are sound reasons documented for not doing so
Purchases of mobile equipment, company vehicles, assets subject to short-term technological obsolescence, and other non-core assets are encouraged to be financed through an operating lease, wherever possible, instead of being purchased.</td></tr>
<tr><td></td><td></td><td>Adequacy Rating: Adequately defined (A)</td><td>Performance Rating: Performing effectively (1)</td></tr>
</table>

No	Effectiveness Criteria	Findings	
1(g)	Costs are justified and cost drivers identified	Through discussion with the Principal Mechanical Engineer WAO Powerhouse and the Project Manager – Project Delivery Wagerup and consideration of Alcoa's asset planning processes, we determined that: • The RfA template and funds authorisation process requires a business case to be prepared, which identifies costs and cost drivers relating to the project • All projects with an estimated value higher than AU$100K are required to seek a preliminary approval prior to commencing each phase of the project, which is required to include all prior costs plus the estimated value to complete the next phase. We examined a RfA for overhaul of a boiler at Pinjarra powerhouse and noted that the project evaluation for the scheduled overhaul identified and considered all costs, including planning, pre-works, procurement of parts and materials, specialist labour and electrical costs. The RfA template also included a specific section on the project's justification and economics as well as a solution analysis to consider alternative options.	
		Adequacy Rating: Adequately defined (A)	**Performance Rating:** Performing effectively (1)

1(h)	Likelihood and consequences of asset failure are predicted	Through discussion with the Principal Mechanical Engineer WAO Powerhouse and review of relevant supporting documentation, we observed that Alcoa has applied mechanisms to identify the likelihood and consequence of powerhouse asset failure, including:
		• Alcoa's Equipment Integrity Dashboard (**the dashboard**) that monitors the integrity and capacity of the powerhouse equipment via a combination of performance indicators including leading, lagging and capacity indicators. The dashboard report:
		  ○ Generates a high level summary of asset performance by providing a total score by weighting and tallying the indicators, which is reported to the relevant global personnel in the quarterly AWA Global Refining Power report
		  ○ Is updated monthly and reported quarterly to Alcoa's Manufacturing and Technology Council
		• Loss prevention inspections to identify mechanical and electrical equipment breakdown exposures that could result in a major loss and discuss proposed options to reduce or eliminate those exposures
		• Classified plant inspections as part of statutory requirements, which involve notifying the respective asset owners about any deficiencies noted during the inspection. Where agreed action is not implemented within a required timeframe, a formal notice is served to senior managers requiring consideration and action
		• An annual high-level review to assess compliance with all licence obligations that is undertaken by the Principal Mechanical Engineer WAO Powerhouse by means of interviews and meetings with staff involved in respective areas. The objective of the review is to determine whether Alcoa has complied with the provisions of its Licence and report results to the ERA by 31 August each year.
		We examined the following documents evidencing Alcoa's actions to predict likelihood and consequence of asset failure:
		• EMM Portal (asset 'Residual Life' reporting metrics)
		• Wagerup and Kwinana Flow Loss Analysis
		• Honeywell live data screenshots (presented through Alcoa's monitoring portal PRISM)
		• Sample Inspection Test Procedures (**ITP**s) for storage vessels and steam turbine maintenance.	

		Adequacy Rating: Adequately defined (A)	**Performance Rating:** Performing effectively (1)

<table>
<tr><th>No</th><th>Effectiveness Criteria</th><th colspan="2">Findings</th></tr>
<tr><td>1(i)</td><td>Plans are regularly reviewed and updated.</td><td colspan="2">Through discussions with the Principal Mechanical Engineer WAO Powerhouse and examination of Asset Strategies for each of Alcoa’s powerhouses, we determined that:
Site level operational plans are prepared and reviewed on an annual basis, and include a rolling five year forecast for the plant to ensure long term utilisation of the powerhouse assets
The WA Operations, location and department level operational plans and objectives are reviewed by Alcoa at regular intervals to identify any critical areas requiring improvement. The review process also enables updates to details of maintenance planning, scheduling, resourcing and execution aspects of powerhouse assets
Alcoa leverages data reporting through EMM and Honeywell to identify improvement opportunities in its asset management and planning processes.
Asset Strategies have been formalised and scheduled to be reviewed at regular intervals or in the event of a major equipment failure. Asset management strategies for each powerhouse provide history of replacements and upgrades, as well as sustainability issues, which detail the current issues under active monitoring (e.g. 125V DC distribution replacement). As such, the strategies detail equipment refurbishment or replacement requirements, as needed
Alcoa’s processes require Asset Strategies to be reviewed for the:
Wagerup site, every four years (last updated February 2015)
Pinjarra site, every five years (last updated August 2016)
Kwinana site, every two years. As the last review was performed in February 2015, the current review is overdue. The Principal Mechanical Engineer WAO Powerhouse advised that Alcoa has reconsidered the appropriateness of the timeframe for reviewing the Kwinana Powerhouse Asset Strategy, to better align with the review timeframes applied to the Wagerup and Pinjarra Powerhouse Asset Strategies.</td></tr>
<tr><td></td><td></td><td>Adequacy Rating: Requires some improvement (B)</td><td>Performance Rating: Performing effectively (1)</td></tr>
<tr><td></td><td colspan="2">Recommendation 2/2017
Alcoa formally assess and, where necessary, amend the timeframe for reviewing its Powerhouse Asset Strategies.</td><td>Action Plan 2/2017
Alcoa will formally assess and, where necessary, amend the timeframe for reviewing its Powerhouse Asset Strategies.
Responsible Person
Principal Mechanical Engineer WAO Powerhouse
Target Date
30 June 2018</td></tr>
</table>

4.2 Asset creation and acquisition

Key process: Asset creation/acquisition means the provision or improvement of an asset where the outlay can be expected to provide benefits beyond the year of outlay

Expected outcome: A more economic, efficient and cost-effective asset acquisition framework which will reduce demand for new assets, lower service costs and improve service delivery

Overall Adequacy/Performance rating: Adequately defined (A) / Performing effectively (1)

<table>
<tr><th>o</th><th>Effectiveness Criteria</th><th colspan="2">Findings</th></tr>
<tr><td>2(a)</td><td>Full project evaluations are undertaken for new assets, including comparative assessment of non-asset solutions</td><td colspan="2">Through discussions with the Principal Mechanical Engineer WAO Powerhouse and the Project Manager – Project Delivery Wagerup and consideration of Alcoa’s planning and expenditure authorisation processes and procedures (as outlined in planning items 1(c) above), we determined that:
Full project evaluations are a requirement of Alcoa’s Expenditure Approval Policy and funds authorisation process, undertaken by means of completing and submitting the RfA. The RfA is supported by an economic evaluation model that utilises a set of economic assumptions, which are reviewed and published by Alcoa on a quarterly basis
The RfA template outlines considerations for instigating new projects, including environmental considerations, asset alternatives, approval requirements, financial and capital requirements, current state assessments and timelines
While Alcoa’s asset strategies consider the option of demand management, owing to the importance of Alcoa’s refinery operations, Alcoa will usually opt for an asset-based solution either through purchase, lease or a commercial arrangement with a third party if required.
We examined a RfA for an overhaul of a boiler at Pinjarra powerhouse and noted that a full project evaluation, aligned with Alcoa’s processes outlined above, was performed.
Adequacy Rating: Adequately defined (A) | Performance Rating: Performing effectively (1)</td></tr>
<tr><td>2(b)</td><td>Evaluations include all lifecycle costs</td><td colspan="2">Through discussions with the Principal Mechanical Engineer WAO Powerhouse and the Project Manager – Project Delivery Wagerup and consideration of Alcoa’s expenditure approval policy and procedures (as outlined in planning item 1(d) above), we determined that:
Lifecycle costs of owning and operating assets are assessed by completing the economic evaluation model, which utilises a set of economic measures such as IRR, NPV and discounted payback period
Project evaluations provide for estimates of the amount of investment required from the global organisation and Alcoa Australia, including identifying the source of funds. The project evaluations are developed by obtaining input from a range of Alcoa personnel, including engineering, finance, environmental and health and safety personnel.
We examined a RfA for overhaul of a boiler at Pinjarra powerhouse and noted that the project evaluation for the scheduled overhaul considered lifecycle costs, including planning, pre-works, procurement of parts and materials, specialist labour and electrical costs.
Adequacy Rating: Adequately defined (A) | Performance Rating: Performing effectively (1)</td></tr>
</table>

o	Effectiveness Criteria	Findings	
2(c)	Projects reflect sound engineering and business decisions	Through discussions with the Principal Mechanical Engineer WAO Powerhouse and Project Manager – Project Delivery Wagerup and consideration of Alcoa's documented procedures, we determined that Alcoa has the following processes in place to manage the assessment of projects (consistent with asset planning item 1(d) above): • Project evaluations are conducted with both engineering and finance personnel input and with evaluation results detailed and approved by relevant personnel to ensure all engineering, finance, environmental, health and safety aspects are addressed • The impact of the project on individual locations is assessed for those capital projects with a value greater than AUD$1 million.	
		Adequacy Rating: Adequately defined (A)	**Performance Rating:** Performing effectively (1)
2(d)	Commissioning tests are documented and completed	Through discussions with the Principal Mechanical Engineer WAO Powerhouse and examination of Alcoa's documented commissioning procedures and templates, we determined that: • Alcoa performed commissioning tests during the review period as part of its standard process for adding/replacing asset components (e.g. during planned shutdowns) • The commissioning procedures are designed to comply with AS/NZS 3788:2006, including the requirement for completion and full documentation of commissioning tests for all components added to Alcoa's refinery assets, including Alcoa powerhouses • The results from commissioning tests are required to be recorded in the machinery safety device record book by the witnessing coordinator and also forwarded to the powerhouse senior mechanical engineer.	
		Adequacy Rating: Adequately defined (A)	**Performance Rating:** Performing effectively (1)
2(e)	Ongoing legal/environmental/safety obligations of the asset owner are assigned and understood.	Through discussions with the Principal Mechanical Engineer WAO Powerhouse and examination of Alcoa's documented policies and procedures, we determined that Alcoa continues to have processes in place to manage its legal, environmental and safety obligations. Specifically: • Alcoa's RfA template outlines the considerations for instigating a new capital project, including environmental considerations, asset alternatives, the approval history, financial and capital requirements, current state assessments and timelines • Alcoa's environmental obligations relevant to its WA Powerhouse operations are identified and managed by the Environmental Team and recorded on an Environmental Obligations Register • The Environmental Manager at each site is responsible for ensuring that the accountable operating centre/business unit managers are aware of their requirements to monitor and report on legislative compliance • Alcoa's safety obligations relevant to its WA Powerhouse operations continue to be rated as areas of high risk within Alcoa. Safety aspects are addressed at the point of employee induction and through specific and ongoing training, formal assignment of responsibilities to supervisory staff and use of the Access Hazardous Materials Database. A centralised training register is used to record information pertaining to the training, qualification and certification of staff who perform functions affecting safety and environmental management	

o	Effectiveness Criteria	Findings	
		• Alcoa's legal obligations from its WA Powerhouse operations relate primarily to environmental and safety matters. Other legal obligations are addressed by Alcoa's in-house legal counsel or external legal advisors, as required. We examined documents relating to Alcoa's management of its environmental, safety and legal obligations, including: • Environmental monitoring dashboard • Environment Health and Safety Policy • Environmental, Health & Safety Risk Assessment for Pinjarra and Kwinana Powerhouse • Community Consultation procedure • WAO training requirements listing • (Sample) December 2016 Environmental Protection Act Annual Audit Compliance Report.	
		Adequacy Rating: Adequately defined (A)	**Performance Rating:** Performing effectively (1)

4.3 Asset disposal

Key process: Effective asset disposal frameworks incorporate consideration of alternatives for the disposal of surplus, obsolete, under-performing or unserviceable assets. Alternatives are evaluated in cost-benefit terms

Expected outcome: Effective management of the disposal process will minimise holdings of surplus and under-performing assets and will lower service costs

Overall Adequacy/Performance rating: Adequately defined (A) / Performing effectively (1)

No	Effectiveness Criteria	Findings	

3(a)	Under-utilised and under-performing assets are identified as part of a regular systematic review process	Through discussion with the Principal Mechanical Engineer WAO Powerhouse and examination of relevant supporting documentation, we observed that Alcoa has applied the following mechanisms for identifying under-utilised and under-performing assets:
		• Asset utilisation is tracked on a weekly basis
		• Alcoa performs condition monitoring of its assets through:
		  ○ Live data retrieved from the Honeywell monitoring system
		  ○ The EMMs portal, which provides key metrics on asset availability
		  ○ Reported instances of refinery 'Flow Loss' attributed to Powerhouse disruption
		• Loss prevention inspections are undertaken to identify mechanical and electrical equipment breakdown exposures that could result in a major loss. As a primary component of Alcoa's risk management activities, the inspections propose options to reduce or eliminate those exposures
		• Classified plant inspections are undertaken at regular intervals. The respective asset owners are notified about any deficiencies noted during the inspection. Where agreed action is not implemented within the required timeframe, a formal notice is served to senior managers requiring action
		• Asset life assessments, which are completed on a systematic basis and monitored on an ongoing basis through the 'Residual Life' function within the EMM portal.	

		Adequacy Rating: Adequately defined (A)	**Performance Rating:** Performing effectively (1)

<table>
<tr><th>No</th><th>Effectiveness Criteria</th><th colspan="2">Findings</th></tr>
<tr><td rowspan="2">3(b)</td><td rowspan="2">The reasons for under-utilisation or poor performance are critically examined and corrective action or disposal undertaken</td><td colspan="2">Through discussion with the Principal Mechanical Engineer WAO Powerhouse and examination of relevant supporting documentation, we observed that Alcoa has applied the mechanisms described at item 3(a) to facilitate the examination of under-utilised and under-performing assets:
Collecting relevant data and information to enable assessment of the root cause of any under-utilisation or poor performance of Powerhouse assets
Assessments are incorporated into the rolling:
Capital expenditure plans established for WA operations, which detail the major projects for the plant/powerhouse planned for the coming financial year, including any equipment refurbishment, upgrade or replacement
Maintenance planning schedule
Problem identification acts as a driver for the RfA process, which requires the requestor to present a business case detailing why the upgrade/purchase of equipment is important to the condition of the asset.</td></tr>
<tr><td>Adequacy Rating: Adequately defined (A)</td><td>Performance Rating: Performing effectively (1)</td></tr>
<tr><td rowspan="2">3(c)</td><td rowspan="2">Disposal alternatives are evaluated</td><td colspan="2">Through discussion with the Principal Mechanical Engineer WAO Powerhouse and examination of Alcoa’s Asset Strategies and decommissioning support documentation, we determined that:
Alcoa’s overarching approach to asset management prefers ongoing asset monitoring and maintenance over asset disposal. As such, decommissioning activities are uncommon for Alcoa’s Powerhouse assets. The Principal Mechanical Engineer WAO Powerhouse advised that no decommissioning events took place during the review period
Alcoa’s processes require addressing alternatives for decommissioning, removal or storage of key plant or where an item of registered plant is to be permanently removed from site
A Surplus Equipment Report (SER) is required to be completed when assets are disposed, which requires justification on the disposal of equipment and approvals from management and financial stakeholders.</td></tr>
<tr><td>Adequacy Rating: Adequately defined (A)</td><td>Performance Rating: Performing effectively (1)</td></tr>
</table>

No	Effectiveness Criteria	Findings	

3(d)	There is a replacement strategy for assets.	Through discussion with the Principal Mechanical Engineer WAO Powerhouse and examination of the Asset Strategies for each of Alcoa's powerhouses indicates that Alcoa's strategy does not envisage or promote complete asset replacement during the projected operating lifetime of the refinery. Alcoa's processes provide for:
		• Asset replacement to occur only in special circumstances (which will be driven by the project management framework outlined in 'No 2 Asset Creation and Acquisition' above)
		• Alcoa to monitor and control asset degradation through:
		  ○ Equipment Management Strategies (**EMS**), which are designed to mitigate the risk of asset failure
		  ○ Ongoing inspections and loss prevention analysis
		  ○ Live monitoring data in its Honeywell system
		  ○ Residual life KPIs within its EMM portal.
		As part of examining Alcoa's strategy towards asset management and prevention of degradation, we:
		• Performed a walkthrough of the asset Residual Life reporting metric within EMM (observing the historical management of Residual Life for Condensate Tanks)
		• Obtained an example of a Wagerup Gas Turbine Inspection and Failure presentation (March 2014)
		• EMS for:
		  ○ Kwinana Boiler Feed Pumps
		  ○ Wagerup Gas Turbines
		  ○ Pinjarra Boilers.	

		Adequacy Rating: Adequately defined (A)	**Performance Rating:** Performing effectively (1)

4.4 Environmental analysis

Key process: Environmental analysis examines the asset system environment and assesses all external factors affecting the asset system.

Expected outcome: The asset management system regularly assesses external opportunities and threats and takes corrective action to maintain performance requirements.

Overall Adequacy/Performance rating: Adequately defined (A) / Performing effectively (1)

No	Effectiveness Criteria	Findings	

4(a)	Opportunities and threats in the system environment are assessed	Through discussion with the WA Powerhouse Operations Principal Mechanical Engineer, the Kwinana Environmental Scientist and the Pinjarra Environmental Scientist and examination of supporting documentation, we determined that:
		• Alcoa operates under the following statutory legislation and licences:
		  ○ Environmental Operating Licence
		  ○ Mines Safety and Inspection Regulations
		  ○ W.A. Gas Standards (Gas fitting & Consumer Gas Installations) Regulations 1999
		• Alcoa maintains a site-specific Compliance Manual, which outlines:
		  ○ NOx and CO emissions targets and requirements
		  ○ Greenhouse gas emissions obligations under the NGER Act
		  ○ Occupational Health and Safety Regulations
		  ○ Groundwater Monitoring
		  ○ Noise Monitoring (not required for Alcoa Kwinana)
		  ○ Additional licence and Standard requirements (e.g. Dangerous Goods Storage Licence requirements and Plant and Pressure Vessel Registration)
		• Alcoa is obligated to maintain compliance with the site's environmental performance standards, as reported in Environmental Ministerial Performance and Compliance Reports
		• Risks and incidents can be logged by any employee/contractor onto the Environmental, Health and Safety Incident Management System (**EHSIMS**), which are then assessed by the Environmental Team
		• Incidents logged via the EHSIMS are reviewed at daily Powerhouse and refinery meetings
		• Alcoa maintains an Environmental Aspects and Impacts procedure to:
		  ○ Ensure the systematic review of environmental aspects and impacts
		  ○ Facilitate the identification and assessment of opportunities and threats to the Plant operations
		  ○ Comply with ISO 14001, Dangerous Goods regulations and health and safety requirements.	

		Adequacy Rating: Adequately defined (A)	**Performance Rating:** Performing effectively (1)

No	Effectiveness Criteria	Findings

4(b)	Performance standards (availability of service, capacity, continuity, emergency response, etc) are measured and achieved	Through discussion with the WA Powerhouse Operations Principal Mechanical Engineer, the Kwinana Environmental Scientist and the Pinjarra Environmental Scientist, we determined that Alcoa has established the following mechanisms to ensure that performance standards are planned, measured and achieved:
		• The refinery plans and targets, as determined by the WA Operations management group and approved by Alcoa's global management, define the service levels for each of the powerhouses. The plans provide detailed information for the planning aspects of the respective powerhouse assets, including production capacity and performance standards
		• The dashboard presented through PRISM, monitors the integrity and capacity of the powerhouse equipment via a combination of performance indicators. In particular, the dashboard:
		  ○ Comprises:
		  ▪ Leading indicators, which are parameters that may affect equipment integrity, such as an obsolescence index and useful life (e.g. owing to high temperature service, fatigue or corrosion)
		  ▪ Lagging indicators, which provide information on availability and production losses because of equipment failures or limitations
		  ▪ Capacity indicators, which provide an indication of refinery demand and capacity
		  ○ Provides a total score by weighting and tallying the indicators, which is used as a high level summary of asset performance
		  ○ Is updated monthly and reported quarterly to Alcoa's Manufacturing and Technology Council.
		• Performance of the powerhouse is also measured by means of maintenance metrics through EMM, such as:
		  ○ Planned work ratio, which measures how much of the total week is spent on planned work
		  ○ Planned work complete, which measures how much of the work that was planned for the week actually was completed.
		• To address the eventuality of key system failures or major equipment failures, a series of system recovery plans, including black/brown start procedures, have been developed for each powerhouse. The system recovery plans are supported by loss prevention inspections and a detailed review when triggered by a major equipment change or reconfiguration
		• Alcoa continues to engage specialist consultants to assist in monitoring specific aspects of its operations, such as site emissions.
		Adequacy Rating: Adequately defined (A) | **Performance Rating:** Performing effectively (1)

4(c)	Compliance with statutory and regulatory requirements	Through discussion with the WA Powerhouse Operations Principal Mechanical Engineer, the Kwinana Environmental Scientist and the Pinjarra Environmental Scientist and examination of supporting documentation, we determined that:
		• Alcoa operates and monitors its operations in accordance with the following (but not limited to) statutory and regulatory requirements:
		  ○ Mines Safety and Inspection Regulations
		  ○ WA Gas Standards (Gas fitting & Consumer Gas Installations) Regulations 1999

No	Effectiveness Criteria	Findings	
		○ Environmental Operating Licence, which includes NOx emissions targets and requirements. We observed that monitoring of NOx emissions is undertaken on a continuous basis to enable reporting of any breaches in accordance with the environmental licence requirements. Alcoa has maintained the ISO-14001 standard and is required to maintain an effective Environmental Management System that monitors all obligations that have an environmental focus ○ Environmental Noise Regulations licence, which specifies the maximum night and day noise levels as measured at the boundary. This requirement is not applicable for Alcoa Kwinana ○ Occupational Health and Safety Regulations ○ Annual reports, which are prepared and lodged by Alcoa. Review of previous reports showed no non-compliance issues lodged.	
		Adequacy Rating: Adequately defined (A)	**Performance Rating:** Performing effectively (1)
4(d)	Achievement of customer service levels	Through discussion with the WA Powerhouse Operations Principal Mechanical Engineer, the Kwinana Environmental Scientist and the Pinjarra Environmental Scientist and examination of supporting documentation, we determined that: • Alcoa does not have external customer service levels to attain in relation to its powerhouse operations • The powerhouses serve to deliver the required power for Alcoa's refinery operations • Required service levels are set based on output required to facilitate refinery operations and are monitored through continuous performance and outage reporting (refer to 3(a) and 4(b) for further commentary on performance monitoring).	
		Adequacy Rating: Adequately defined (A)	**Performance Rating:** Performing effectively (1)

4.5 Asset operations

Key process: Operations functions relate to the day-to-day running of assets and directly affect service levels and costs

Expected outcome: Operations plans adequately document the processes and knowledge of staff in the operation of assets so that service levels can be consistently achieved

Overall Adequacy/Performance rating: Adequately defined (A) / Performing effectively (1)

No	Effectiveness Criteria	Findings	

5(a)	Operational policies and procedures are documented and linked to service levels required	Through discussion with the WA Powerhouse Operations Principal Mechanical Engineer and examination of supporting documentation, we determined that:
		• Site specific Powerhouse asset strategies have been developed to optimise the long term utilisation of the powerhouse assets, and describes how and why they will be operated and maintained
		• Reporting dashboards such as Asset Utilisation spreadsheets have been established to provide a weekly summary of the site's performance
		• Alcoa has:
		  ○ Documented its powerhouse related policies, procedures and protocols
		  ○ Developed procedures, which specifically refer to required service levels (where appropriate) for the operation of the specific item of equipment, or specific electrical or mechanical procedures
		• Developed control plans for major items of plant.	

		Adequacy Rating: Adequately defined (A)	**Performance Rating:** Performing effectively (1)
5(b)	Risk management is applied to prioritise operations tasks	Through discussion with the WA Powerhouse Operations Principal Mechanical Engineer and examination of supporting documentation, we determined that: • A Risk Management Framework has been applied to Alcoa's operations across all sites (Kwinana, Pinjarra and Wagerup) to enable making risk-based decisions in relation to operational matters • Alcoa also applies a structured, risk-based approach to its O&M activities. In particular, operational tasks focus on people and safety risks first, followed by environmental risks, then customer related risks.	
		Adequacy Rating: Adequately defined (A)	**Performance Rating:** Performing effectively (1)

No	Effectiveness Criteria	Findings	
5(c)	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	Through discussion with the WA Powerhouse Operations Principal Mechanical Engineer and examination of supporting documentation, we determined that Alcoa: • Manages powerhouse equipment through its eAMS, which contains the following information for major equipment: ○ Unique asset identification (asset ID) ○ Equipment details, including type, location, components, operational capacity, age, expected life ○ Equipment history, including condition ○ Maintenance procedures ○ Maintenance intervals ○ Purchase cost, depreciation rates and net book value • Monitors the value of assets (including depreciation) through its Financial Assets Register.	
		Adequacy Rating: Adequately defined (A)	**Performance Rating:** Performing effectively (1)
5(d)	Operational costs are measured and monitored	Through discussion with the WA Powerhouse Operations Principal Mechanical Engineer and examination of supporting reports and models, we determined that: • Alcoa prepares a site-specific monthly report detailing: ○ Operational costs incurred ○ Capital expenditure ○ Analysis of actual expenditure against budgeted expenditure. • Significant variances between actual and budgeted expenditure are scrutinised • Costs are allocated to assets automatically based on the work order and external costs are allocated to the relevant cost centre, which has relevant links to assets.	
		Adequacy Rating: Adequately defined (A)	**Performance Rating:** Performing effectively (1)
5(e)	Staff resources are adequate and staff receive training commensurate with their responsibilities	Through discussion with the WA Powerhouse Operations Principal Mechanical Engineer and examination of supporting training management documentation, we determined that: • Alcoa Powerhouse maintains up-to-date organisation charts for each of their sites • Details of staff training requirements (including qualifications and competence) and training undertaken is maintained through Alcoa's central LMS Training Package • Alcoa's Powerhouse Training Report provides up-to-date statistics on staff training performed and compliance levels achieved • Alcoa utilises its WA Operations Operator Traineeship Program to enable its powerhouse operators to be fully trained in all key aspects of powerhouse operations, relevant to each individual's position • Staff are adequately qualified for their respective roles and their required licences are current.	
		Adequacy Rating: Adequately defined (A)	**Performance Rating:** Performing effectively (1)

4.6 Asset maintenance

Key process: Maintenance functions relate to the upkeep of assets and directly affect service levels and costs.

Expected outcome: Maintenance plans cover the scheduling and resourcing of the maintenance tasks so that work can be done on time and on cost.

Overall Adequacy/Performance rating: Adequately defined (A) / Performing effectively (1)

No	Effectiveness Criteria	Findings	

6(a)	Maintenance policies and procedures are documented and linked to service levels required	Through discussion with the WA Powerhouse Operations Principal Mechanical Engineer and examination of Alcoa's Asset Strategies and supplement supporting documentation, we determined that:
		• Alcoa's eAM system references major equipment maintenance procedures, equipment details, maintenance intervals, costs and equipment history and linked to service levels required
		• Alcoa has developed maintenance policies, site-specific EMS for key Powerhouse assets, procedures and protocols, which:
		  ○ Refer to required service levels (where appropriate) for the operation of the specific item of equipment, or specific electrical or mechanical procedures
		  ○ Provide for required inspection testing and loss prevention monitoring processes
		• Supporting procedures are documented within the Alcoa WA Operations Performance Support System.	

		Adequacy Rating: Adequately defined (A)	**Performance Rating:** Performing effectively (1)
6(b)	Regular inspections are undertaken of asset performance and condition	Through discussion with the WA Powerhouse Operations Principal Mechanical Engineer and examination of Alcoa's inspection testing supporting documentation, we determined that: • Alcoa applies a structured program for key mechanical and electrical assets (such as turbines, feedwater pumps, transformers, generators, switchgear) to be condition monitored using online vibration monitoring devices and for earthing systems and protection relays to be regularly tested (including partial discharge) to avoid unplanned outages or failures • Equipment assessment and inspection reports are generated and made available to staff and management, providing information on equipment condition and performance • Signed ITPs were sighted for various mechanical and electrical assets that are filled on a regular basis.	
		Adequacy Rating: Adequately defined (A)	**Performance Rating:** Performing effectively (1)
6(c)	Maintenance plans (emergency, corrective and preventative) are documented and completed on schedule	Through discussion with the WA Powerhouse Operations Principal Mechanical Engineer and examination of supporting documentation, we determined that: • For each major equipment, the eAM system contains plans for scheduled maintenance as well as required emergency and corrective works • All maintenance work undertaken is recorded in the eAM system • Alcoa's operational requirements lead to emergency and corrective works having the highest priority due to the impact on refinery production • Maintenance schedules are monitored • Maintenance strategies are reviewed on a yearly basis or when there are significant events that affect the assets.	

<table>
<tr><th>No</th><th>Effectiveness Criteria</th><th colspan="2">Findings</th></tr>
<tr><td></td><td></td><td colspan="2">We sighted examples of maintenance work order activity reports on Alcoa's EMMs portal, which contains information on completion rates and overdue work orders categorised by priority.
Alcoa's prioritisation of maintenance work orders is based on its operational requirements (e.g. emergency and corrective works having higher priority), its statutory obligations and designation of critical assets.
Its EMMs portal also provides a strong capability for monitoring performance metrics such as the 'Late Critical Compliance %' metric, which reports details of overdue work orders relating to critical assets. The Principal Mechanical Engineer WAO Powerhouse also advised of Alcoa's intention to leverage its data and reporting capabilities to drive further maintenance efficiencies, which demonstrates a focus on continuous improvement in its approach to maintenance.
We recognise that Alcoa's work order planning and monitoring processes are driven by experienced staff/managers who are responsible for maintaining powerhouse reliability, however those processes can be further improved with more structured guidance on the relevant priority of maintenance tasks. By further distinguishing between lower and higher priority tasks, Alcoa will be better placed to complete the most critical maintenance within the required timeframes and to further improve efficiencies by minimising investment in lowest priority work orders.</td></tr>
<tr><td></td><td></td><td>Adequacy Rating: Adequately defined (A)</td><td>Performance Rating: Opportunity for improvement (2)</td></tr>
<tr><td></td><td colspan="2">Recommendation 3/2017
Alcoa:
(a) Investigate the capability of its work order planning and monitoring processes to introduce a further degree of work order prioritisation
(b) Consider the potential to further rationalise the number of maintenance tasks assigned as critical (i.e. to re-assign with a lower priority).</td><td>Action Plan 3/2017
Alcoa will:
(a) Investigate the capability of its work order planning and monitoring processes to introduce a further degree of work order prioritisation
(b) Consider the potential to further rationalise the number of maintenance tasks assigned as critical (i.e. to re-assign with a lower priority).
Responsible Person
Principal Mechanical Engineer WAO Powerhouse
Target Date:
30 June 2018</td></tr>
<tr><td>6(d)</td><td>Failures are analysed and operational/maintenance plans adjusted where necessary</td><td colspan="2">Through discussion with the WA Powerhouse Operations Principal Mechanical Engineer and examination of supporting documentation, we determined that:
Failures are analysed and operational/maintenance plans are adjusted to reduce the likelihood of the failure to be repeated
Emergency and corrective actions were taken, followed by a root cause analysis of the failure event such as a trip or fail-to-start
Where the failure required adjustments to the maintenance procedure, the adjustment was effected.
Refer to 1(h) – for further findings on asset failure.</td></tr>
<tr><td></td><td></td><td>Adequacy Rating: Adequately defined (A)</td><td>Performance Rating: Performing effectively (1)</td></tr>
</table>

<table>
<tr><th>No</th><th>Effectiveness Criteria</th><th colspan="2">Findings</th></tr>
<tr><td>6(e)</td><td>Risk management is applied to prioritise maintenance tasks</td><td colspan="2">Through discussion with the WA Powerhouse Operations Principal Mechanical Engineer and examination of supporting documentation, we determined that:
All maintenance activities are based on a risk management approach, whereby the maintenance tasks addressing higher risk issues are performed first in order, followed by lower priority tasks
Statutory requirements and asset type are considered when determining the criticality of maintenance activities
Daily meetings are used to arrange:
Daily work plans
Plans for upcoming work
Outage plans for major scheduled outages
Alcoa uses the EMM portal to monitor and report on completion of critical tasks
A risk-based approach is used to defer any maintenance works from its scheduled outage.
Refer to section 8 for broader findings on risk management.</td></tr>
<tr><td></td><td></td><td>Adequacy Rating: Adequately defined (A)</td><td>Performance Rating: Performing effectively (1)</td></tr>
<tr><td>6(f)</td><td>Maintenance costs are measured and monitored.</td><td colspan="2">Through discussion with the WA Powerhouse Operations Principal Mechanical Engineer and Management Accountant (Kwinana) and examination of supporting documentation, we determined that:
Alcoa prepares a site-specific monthly report detailing:
Maintenance costs incurred
Capital expenditure
Analysis of actual expenditure against budgeted expenditure
Significant variances between actual and budgeted expenditure are scrutinised
Costs are allocated to assets automatically based on the work order and external costs are allocated to the relevant cost centre, which has relevant links to assets.</td></tr>
<tr><td></td><td></td><td>Adequacy Rating: Adequately defined (A)</td><td>Performance Rating: Performing effectively (1)</td></tr>
</table>

4.7 Asset management information system

Key process: An asset management information system is a combination of processes, data and software that support the asset management functions

Expected outcome: The asset management information system provides authorised, complete and accurate information for the day-to-date running of the asset management system. The focus of the review is the accuracy of performance information used by the licensee to monitor and report on service standards.

Overall Adequacy/Performance rating: Adequately defined (A) / Performing effectively (1)

No	Effectiveness Criteria	Findings	
7(a)	Adequate system documentation for users and IT operators	Through discussion with the WA Powerhouse Operations Principal Mechanical Engineer, we understand that Alcoa is supported by the Global Support Centre (**GSC**) for the Oracle E-Business Suite, which houses the range of applications used by Alcoa's operations, including eAM system. From our discussions, we determined that: • GSC provides technical support for eAM system under a Service Level Agreement • Technical documentation for eAM system are managed and maintained by the GSC • Alcoa Performance Support System (APSS) stores user support documentation and provides document version control by assigning a unique identification number to each controlled document • User guides are kept up to date by the Functional Support Representative and key users.	
		Adequacy Rating: Adequately defined (A)	**Performance Rating:** Performing effectively (1)
7(b)	Input controls include appropriate verification and validation of data entered into the system	Through discussion with the WA Powerhouse Operations Principal Mechanical Engineer and examination of Alcoa's Information system supporting documentation, we determined that: • Input controls are managed through built-in checks in Oracle and manual processes • Processes are in place to verify and validate data entered into the eAM system, including data reconciliation between old and new systems, checking data transferred between one system to another is accurate, timely and complete and validating data as close as possible to the point of origin, which includes the ability to trace data back to the source document • Alcoa's eAM system input controls are subject to annual testing by Alcoa's auditors, PricewaterhouseCoopers, as part of broader controls testing.	
		Adequacy Rating: Adequately defined (A)	**Performance Rating:** Performing effectively (1)

No	Effectiveness Criteria	Findings	
7(c)	Logical security access controls appear adequate, such as passwords	Through discussion with the WA Powerhouse Operations Principal Mechanical Engineer and consideration of Alcoa's security access and account management policies and procedures, we determined that: • Alcoa's Security Access Policy (Australia) is based on Alcoa's global security standards as outlined in the Security Access Account Management Standard • Logical security access is managed through the Access Request Facility (**ARF**) systems, where all users are assigned a unique user account and password • Account password requirements have been enhanced during the review period to include a minimum of eight characters, which includes a mixture of alphabetical, numerical and special characters. Alcoa's security policy requires users to change their password every 60 days • Alcoa utilises the Courion password management tool to synchronise passwords for the overall Oracle suite within the Windows environment.	
		Adequacy Rating: Adequately defined (A)	**Performance Rating:** Performing effectively (1)
7(d)	Physical security access controls appear adequate	Through discussion with the WA Powerhouse Operations Principal Mechanical Engineer and consideration of Alcoa's security access policies and procedures, we determined that: • Access swipe cards are used to restrict and record physical access to the data centre. Access is revoked on termination of an employee and the swipe cards returned to the management of data centre building • A review of access logs to the data centre is undertaken by the Data Centre Manager on a quarterly basis to identify any unauthorised access and take corrective action, if required • Contractors are required to be accompanied by appropriate IT personnel when working in the data centre, unless the contractors are formally inducted and permitted to be based in the data centre • Alcoa has instigated precautions to contain fire and other damaging events in its Data Centre. There are fire extinguishers located within and near the data centre. Temperature, humidity and flood sensors can be found in the room and notification is sent to the building facility management if any of the sensors are triggered.	
		Adequacy Rating: Adequately defined (A)	**Performance Rating:** Performing effectively (1)
7(e)	Data backup procedures appear adequate and backups are tested	Through discussion with the WA Powerhouse Operations Principal Mechanical Engineer and consideration of Alcoa's backup and recovery procedures, we observed that: • Backups of production data occur on a daily basis • EBS data, which includes eAM system data, is backed up on a nightly basis • Archiving and off-site storage is managed by Recall • Alcoa's ASAT testing for backup processes is now managed by Alcoa's Internal Audit team • Alcoa's processes provide for system recovery exercises to be conducted as part of disaster recovery plan testing • Alcoa had tested its backup and system recovery processes (which include eAM data) during the review period. Results of those tests are integrated into the appendices of the relevant procedural documents (e.g. the Application Recovery Plan – Enterprise Asset Management).	
		Adequacy Rating: Adequately defined (A)	**Performance Rating:** Performing effectively (1)

No	Effectiveness Criteria	Findings	
7(f)	Key computations related to licensee performance reporting are materially accurate	For the purpose of Alcoa's licence performance reporting to the ERA in accordance with its Licence requirements, Alcoa does not directly extract data from the eAM system and is not directly reliant on computations from that system.	
		Adequacy Rating: Not rated	**Performance Rating:** Not rated
7(g)	Management reports appear adequate for the licensee to monitor licence obligations.	Through discussion with the Principal Mechanical Engineer WAO Powerhouse, consideration of Alcoa's ASAT testing and examination of the asset strategies for Pinjarra, Wagerup and Kwinana, we observed that (consistent with AMS review item 12(a) below), Alcoa has the following processes in place to monitor licence obligations: • Asset Strategies reference the licence obligations outlining the 12 key processes of the asset management system subject to review by the ERA • An annual high-level review to assess compliance with all licence obligations that is undertaken by the Principal Mechanical Engineer WAO Powerhouse by means of interviews and meetings with staff involved in respective areas. The objective of the review is to determine whether Alcoa has complied with the provisions of its Licence and can report results to the ERA by 31 August each year • The Energy Projects Manager has been designated the responsible person for monitoring compliance with regulatory requirements • The Principal Mechanical Engineer WAO Powerhouse is responsible for monitoring the assessment management strategies and performing a review on a regular cycle or in the event of a major equipment failure.	
		Adequacy Rating: Adequately defined (A)	**Performance Rating:** Performing effectively (1)

4.8 Risk management

Key process: Risk management involves the identification of risks and their management within an acceptable level of risk.
Expected outcome: An effective risk management framework is applied to manage risks related to the maintenance of service standards.
Overall Adequacy/Performance rating: Adequately defined (A) / Performing effectively (1)

No	Effectiveness Criteria	Findings	
8(a)	Risk management policies and procedures exist and are being applied to minimise internal and external risks associated with the asset management system	Through discussion with the Principal Mechanical Engineer WAO Powerhouse and examination of Alcoa's risk management practices, we observed that: • Within the application of the Alcoa Business System, Alcoa incorporates risk management as a fundamental aspect of its decision-making processes • Alcoa has developed risk management policies and procedures designed to align with AS/NZS 4360:2004. The policy outlines the criteria for risk assessments and the steps in the risk management process. The process specifically steps through (a) Establishing the context, (b) Identifying risks, (c) Examining controls, (d) Evaluating the risk, (e) Establishment of risk treatment plans and (f) Monitoring and review of risks on a periodic basis • Overall responsibility for risk management lies with Alcoa's Loss Prevention Engineer, who is assisted by external engineering risk consultants • For all Major Hazard equipment at each refinery site (including powerhouse boilers, turbine alternators, deaerator, CoGen units), there are Major Hazard equipment single point accountability personnel (**SPAs**) in the areas of Operations, Maintenance and Engineering. These personnel, delegated by the WAO Powerhouse Manager, are jointly responsible for managing the critical controls surrounding Major Hazard equipment (including Change Control procedures) • An annual high-level review to assess compliance with all licence obligations is undertaken by the Principal Mechanical Engineer WAO Powerhouse by means of interviews and meetings with staff involved in respective areas. The objective of the review is to determine whether Alcoa has complied with the provisions of its Licence and can report results to the ERA by 31 August each year. We observed evidence of risk management activities being applied to WAO Powerhouse planning and management activities. We examined the aspects and impacts register for the Pinjarra powerhouse, completed ASATs and insurance loss prevention reviews. However, as a minor point to note, Alcoa's suite of risk management policies and procedures refer to the outdated Risk Management Australian standard AS/NZS 4360:2004. The new risk management standard AS/NZS ISO 31000:2009, although not fundamentally different to the old standard, has been updated, including a new definition of risk, and provides a greater emphasis on how risk management should be implemented and integrated into an organisation.	
		Adequacy Rating: Requires some improvement (B)	**Performance Rating:** Performing effectively (1)
	Recommendation 3/2013 (per 2013 AMS review report) Alcoa update the Risk Management suite of documents to reflect the revised Risk Management standard AS/NZS ISO 31000:2009.	**Action Plan 3/2013** Alcoa will update its risk management suite of documentation to reflect the revised Risk Management standard. **Responsible Person:** Principal Mechanical Engineer WAO Powerhouse **Target Date:** 30 June 2018	

No	Effectiveness Criteria	Findings	
8(b)	Risks are documented in a risk register and treatment plans are actioned and monitored	Through discussion with the Principal Mechanical Engineer WAO Powerhouse and examination of the risk management procedure, we determined that Alcoa documents risks in a risk register for monitoring and periodic evaluation. In particular, we noted: • The primary tool used by WAO Powerhouse operations to capture risks related to its powerhouses is the insurance loss prevention reviews and associated recommendation summaries prepared for each powerhouse. The reviews assist with identifying mechanical and electrical equipment breakdown risks and proposed recommendations for reducing or eliminating those exposures • Alcoa has developed a risk management methodology, which is designed to align with AS/NZS 4360:2004 and outlines the process for assessing risk identified in Alcoa's operating environment and developing mitigation strategies • The recommendation summaries are compiled to represent a live risk register for each site, with the recommendations assigned to a responsible person with the status expected to be reviewed and updated every three to four months • Alcoa has developed an aspects and impacts register, which specifically documents risks relating to environmental, health and safety concerns of the Powerhouse operations.	
		Adequacy Rating: Adequately defined (A)	**Performance Rating:** Performing effectively (1)

No	Effectiveness Criteria	Findings	

8(c)	The probability and consequences of asset failure are regularly assessed.	Through discussion with the Principal Mechanical Engineer WAO Powerhouse, examination of Alcoa's Asset Strategies and consideration of Alcoa's asset planning and risk management practices (refer to 1(h)), we determined that Alcoa has applied the following mechanisms for identifying and assessing the consequence and likelihood of powerhouse asset failure:
		• Its approach to risk management and asset failure is outlined in its Asset Strategies and task-based risk assessments (e.g. for project works or maintenance activities)
		• An Equipment Integrity Dashboard (**the dashboard**) is used to monitor the integrity and capacity of powerhouse equipment via a combination of performance indicators including leading, lagging and capacity indicators. The dashboard report:
		  ○ Generates a high level summary of asset performance by providing a total score by weighting and tallying the indicators, which is reported to the relevant global personnel in the quarterly AWA Global Refining Power report
		  ○ Is updated monthly and reported quarterly to Alcoa's Manufacturing and Technology Council
		• Loss prevention inspections to identify mechanical and electrical equipment breakdown exposures that could result in a major loss
		• During scheduled outages (e.g. long term shutdowns), main components of the plant are inspected for defects by Alcoa site staff and external contractors
		• Classified plant inspections are conducted in accordance with the statutory requirements imposed upon the plant
		• Condition monitoring techniques are employed on a frequent basis to identify defects
		• The management and maintenance of the plant assets is reviewed on a day-to-day basis at an operational level and on an annual basis, primarily through the review of Asset Strategies
		• A high level of priority is accorded to minimising instances of asset failure and the duration of any such failure
		• The management structures, skills and resources assigned by Alcoa to the required asset management processes appear to be appropriate for enabling the regular assessment of the probability and consequences of asset failure.	

		Adequacy Rating: Adequately defined (A)	**Performance Rating:** Performing effectively (1)

4.9 Contingency planning

Key process: Contingency plans document the steps to deal with the unexpected failure of an asset
Expected outcome: Contingency plans have been developed and tested to minimise any significant disruptions to service standards
Overall Adequacy/Performance rating: Requires some improvement (B) / Performing effectively (1)

<table>
<tr><th>No</th><th>Effectiveness Criteria</th><th colspan="2">Findings</th></tr>
<tr><td rowspan="3">9(a)</td><td rowspan="2">Contingency plans are documented, understood and tested to confirm their operability and to cover higher risks.</td><td colspan="2">Through discussion with the Principal Mechanical Engineer WAO Powerhouse and examination of relevant supporting documentation, we observed that Alcoa has established a business continuity management framework comprising a series of system recovery plans that are subject to testing in accordance with specified timeframes. Specifically, we observed that:
To address the eventuality of key system or major equipment failures, each site has a disaster planning document that enlists contingency plans for various scenarios relating to engineering and operational aspects
Each of Alcoa’s powerhouses have system recovery plans, including black/brown start procedures as well as a resourced roster to enable the continuation of operations. In the event of a contingency, black start procedures enable recovery from a total shutdown of the power station by facilitating a supply of electricity from an on-site auxiliary generating plant. Conversely, a brown start relates to recovery post a partial shutdown. Alcoa’s process provides for all relevant staff to be assessed for competency in performing brown and black start procedures on a six monthly basis. We sighted formal records of such competency assessments, which are captured in Alcoa’s LMS training register
System recovery plans are subject to a high-level review twice annually via loss prevention inspections and a detailed review when triggered by a major equipment change or reconfiguration
Alcoa’s powerhouse workforce is resourced and trained to respond to powerhouse equipment losses in order to minimise the interruption to operations.
For each of its refinery sites (inclusive of powerhouse operations), Alcoa maintains Emergency Response Procedures (**ERP**s) as a component of its suite of policies and procedures for contingency management. ERPs cover larger scale crisis events, which may disrupt operations.
We observed evidence of mock emergency response activities performed during the review period as part of refinery ERPs. However Alcoa has not applied a coordinated approach to ensure its ERPs capture Alcoa’s requirements for the method and frequency of test procedures.</td></tr>
<tr><td>Adequacy Rating: Requires some improvement (B)</td><td>Performance Rating: Performing effectively (1)</td></tr>
<tr><td colspan="2">Recommendation 4/2017
Alcoa update its ERPs to provide for:
Frequency of testing
Method of testing
Required documentation/reporting outputs
A lessons learned mechanism.</td><td colspan="2">Action Plan 4/2017
Alcoa will update its ERPs to provide for:
Frequency of testing
Method of testing
Required documentation/reporting outputs
A lessons learned mechanism.
Responsible Person
Principal Mechanical Engineer WAO Powerhouse
Target Date
30 June 2018</td></tr>
</table>

4.10 Financial planning

Key process: The financial planning component of the asset management plan brings together the financial elements of the service delivery to ensure its financial viability over the long term

Expected outcome: A financial plan that is reliable and provides for the long-term financial viability of the services

Overall Adequacy/Performance rating: Adequately defined (A) / Performing effectively (1)

No	Effectiveness Criteria	Findings	
10(a)	The financial plan states the financial objectives and strategies and actions to achieve the objectives	Through discussion with the Principal Mechanical Engineer WAO Powerhouse and Management Accountant (Kwinana) and consideration of Alcoa's financial planning mechanisms, we observed that: • The financial objectives and strategies of the WA Operations business are driven by Alcoa's overall corporate objectives set by the global organisation and cascaded down through the business units • WAO powerhouses are required to submit a plan and budget that cover labour requirements, maintenance requirements and other operational costs. The maintenance plan is determined based on scheduled work for major items plus base workload. Data is sourced from the maintenance system with reference to the five year plan for each powerhouse • WAO powerhouse plans also take account of required powerhouse output to support the refinery i.e. required levels of steam and electric power generation.	
		Adequacy Rating: Adequately defined (A)	**Performance Rating:** Performing effectively (1)
10(b)	The financial plan identifies the source of funds for capital expenditure and recurrent costs	Through discussion with the Principal Mechanical Engineer WAO Powerhouse and Management Accountant (Kwinana) and consideration of Alcoa's financial planning mechanisms, we observed that: • Any application for funds made by Alcoa WA Operations is not required to identify the specific source of funds • Individual powerhouse plans form part of the site level plan, which is rolled up into the WA Operations, then to Alcoa Australia and ultimately to Alcoa US for final sign-off • Financial plans are submitted to the Alcoa global organisation for interrogation to determine viability and appropriateness of the request. The plan is then approved by the Alcoa global organisation if it is considered appropriate.	
		Adequacy Rating: Adequately defined (A)	**Performance Rating:** Performing effectively (1)
10(c)	The financial plan provides projections of operating statements (profit and loss) and statement of financial position (balance sheets)	Through discussion with the Principal Mechanical Engineer WAO Powerhouse and Management Accountant (Kwinana) and consideration of Alcoa's financial planning mechanisms, we observed that: • Although projections of operating statements and statement of financial position do not occur specifically at the powerhouse level, those projections take account of powerhouse operations as part of the entire WA Operations business projections • Budgets and management reporting is broken down to the powerhouse level. Primarily, reporting to the powerhouse is in relation to costs, utilising expense control reports • Projections of operating statements and statements of financial position are submitted at a detailed level for the next year, with higher level projections for a further two years also submitted.	
		Adequacy Rating: Adequately defined (A)	**Performance Rating:** Performing effectively (1)

No	Effectiveness Criteria	Findings	
10(d)	The financial plan provides firm predictions on income for the next five years and reasonable indicative predictions beyond this period	Through discussion with the Principal Mechanical Engineer WAO Powerhouse and Management Accountant (Kwinana) and consideration of Alcoa's financial planning mechanisms, we observed that: • Three year financial plans are developed at a high level • Capital funding plans are developed for periods of up to 10 years. We note that the financial plan does not provide detail of each powerhouse's revenue and therefore impact on financial objectives and strategies as the output of the powerhouses is not intended as a main income source, rather a bi-product of supporting refinery operations.	
		Adequacy Rating: Adequately defined (A)	**Performance Rating:** Performing effectively (1)
10(e)	The financial plan provides for the operations and maintenance, administration and capital expenditure requirements of the services	Through discussion with the Principal Mechanical Engineer WAO Powerhouse and Management Accountant (Kwinana) and consideration of Alcoa's financial planning mechanisms, we observed that Alcoa's models: • Provide a detailed monthly view of operational expenditure i.e. operations maintenance and administration expenses on a rolling five year basis • Include a summary of current and planned capital expenditure projects over the following five years, with a brief description of each project's purpose and assumptions.	
		Adequacy Rating: Adequately defined (A)	**Performance Rating:** Performing effectively (1)
10(f)	Significant variances in actual/budget income and expenses are identified and corrective action taken where necessary.	Through discussion with the Pinjarra Powerhouse Business Advisor and Principal Mechanical Engineer WAO Powerhouse and examination of an Expense Control Report (**ECR**) and Operational and Maintenance Cost Reports, we observed: • Operational and maintenance cost reports are produced on a daily basis • ECRs are produced on a monthly basis for each site, enabling management to specifically assess powerhouse actual against budgeted expenditure, identify cost centres that are over budget or problematic and to determine necessary corrective action • The WAO Powerhouse group meets every week, of which one meeting per month is set aside as a formal cost review. Actual performance against plan is reviewed in addition to the expected year end outcome. Each month there is a formal process to reforecast the rest of year expenditure to determine the full year position.	
		Adequacy Rating: Adequately defined (A)	**Performance Rating:** Performing effectively (1)

4.11 Capital expenditure planning

Key process: The capital expenditure plan provides a schedule of new works, rehabilitation and replacement works, together with estimated annual expenditure on each over the next five or more years. Since capital investments tend to be large and lumpy, projections would normally be expected to cover at least 10 years, preferably longer. Projections over the next five years would usually be based on firm estimates

Expected outcome: A capital expenditure plan that provides reliable forward estimates of capital expenditure and asset disposal income, supported by documentation of the reasons for the decisions and evaluation of alternatives and options

Overall Adequacy/Performance rating: Adequately defined (A) / Performing effectively (1)

No	Effectiveness Criteria	Findings	
11(a)	There is a capital expenditure plan that covers issues to be addressed, actions proposed, responsibilities and dates	Through discussion with the Principal Mechanical Engineer WAO Powerhouse and the Project Manager – Project Delivery Wagerup and consideration of Alcoa's project planning processes and supporting models, we determined that: • The Alcoa global organisation prepares rolling three and 10 year capital plans that are reviewed by all levels of regional management to enable an annual allocation of funds. The capital plan process commences in July, with full delivery of the annual plan by November of that year • RfA templates and procedures are used to identify capital expenditure amounts required for a particular period. The RfA amounts form part of the capital plans and facilitate the update of the full year forecasts • The capital expenditure plan outlines projects and associated expenditure over a ten year timeframe including reason codes, project start and end dates and ranks the projects based on priority and criticality to the site's operations • The Capital Program Manager is responsible for the capital planning process and subsequent product • Approval requests for projects above AUD$250k are required to be supported by justification demonstrating alignment to the site and regional strategic plans, which includes asset replacement and cost reduction strategies. Identification of projects by location serves to clarify the responsibilities for progression. Examination of an extract from the capital expenditure plan detailing projects related to the Alcoa Powerhouses indicated that the requirements of 11(a) are maintained within the plan.	
		Adequacy Rating: Adequately defined (A)	**Performance Rating:** Performing effectively (1)

No	Effectiveness Criteria	Findings	
11(b)	The plan provides reasons for capital expenditure and timing of expenditure	Through discussion with the Principal Mechanical Engineer WAO Powerhouse and the Project Manager – Project Delivery Wagerup and consideration of Alcoa's project planning processes and supporting models, we determined that: • Alcoa's Expenditure Approval Policy and Procedures require all projects with measurable financial benefits to be evaluated using an economic evaluation model that includes a set of high level economic assumptions published on a quarterly basis • The capital expenditure plan identifies individual capital projects by site and operation centre and reflects the objectives and benefits of completing the project. The plan also indicates the period in which an expenditure amount is planned, including project start and end dates and reasons for the expenditure by code such as health and safety or maintenance • As part of the RfA process, the following are elements that are required to be identified, which support the reasoning and timing of the expenditure: o The reasons for instigating new projects (e.g. environmental considerations) i.e. the business case o Financial and capital requirements o Current state assessment and timeline for the project and expected expenditure timing • RfA templates are used as the supporting documentation (once approved) that feeds into the capital plan for site operations • Capital projects in excess of AUD$250K are required to seek approval using the RfA process to justify the reasoning and timing of the expenditure. The RfA template is designed to consider specific aspects of the project including environmental considerations, asset alternatives, approval requirements, financial and capital requirements, current state assessment and timeline.	
		Adequacy Rating: Adequately defined (A)	**Performance Rating:** Performing effectively (1)
11(c)	The capital expenditure plan is consistent with the asset life and condition identified in the asset management plan	Through discussion with the Principal Mechanical Engineer WAO Powerhouse and the Project Manager – Project Delivery Wagerup and consideration of Alcoa's project planning processes and supporting models, we determined that Alcoa's: • Procedures address the requirement for lifecycle costs of powerhouse assets to be assessed and recorded in formal project evaluations • Procedures address the requirement for investment and capital expenditure estimates to be calculated and disclosed within the project evaluation phase • Rolling three and 10 year capital expenditure plans accommodate capital projects identified through the business' strategic, business and location/facility planning.	
		Adequacy Rating: Adequately defined (A)	**Performance Rating:** Performing effectively (1)

No	Effectiveness Criteria	Findings	
11(d)	There is an adequate process to ensure that the capital expenditure plan is regularly updated and actioned.	Through discussion with the Principal Mechanical Engineer WAO Powerhouse and the Project Manager – Project Delivery Wagerup and consideration of Alcoa's project planning processes and supporting models, we determined that: • The capital plan is reviewed and updated annually to ensure a continuing alignment with business and strategic plans • A WAO Powerhouse group meeting is held monthly to review actual performance against plan and to reforecast expenditure for remainder of the year to reflect a more accurate position • On completion, the projects are reviewed against the approved criteria to assess whether the project objectives were realised.	
		Adequacy Rating: Adequately defined (A)	**Performance Rating:** Performing effectively (1)

4.12 Review of Asset Management System

Key process: The asset management system is regularly reviewed and updated

Expected outcome: Review of the Asset Management System to ensure the effectiveness of the integration of its components and their currency

Overall Adequacy/Performance rating: Adequately defined (A) / Opportunity for improvement (2)

No	Effectiveness Criteria	Findings	
12(a)	A review process is in place to ensure that the asset management plan and the asset management system described therein are kept current	Through discussion with the Principal Mechanical Engineer WAO Powerhouse and an examination of the Pinjarra, Wagerup and Kwinana Asset Strategies, we determined that Alcoa has put mechanisms in place for the regular review of the asset management system. In particular, we observed that: • The Principal Mechanical Engineer WAO Powerhouse is responsible for reviewing the asset management strategies at regular intervals and in the event of a major equipment failure. Based on examination of the review log for each of the Asset Strategies we determined that they have been reviewed during the review period • The Energy Projects Manager has been designated the responsible person for monitoring compliance with regulatory requirements • An annual high-level review to assess compliance with all licence obligations that is undertaken by the Principal Mechanical Engineer WAO Powerhouse by means of interviews and meetings with staff involved in respective areas. The objective of the review is to determine whether Alcoa has complied with the provisions of its Licence and can report results to the ERA by 31 August each year • Alcoa's processes provide for ASAT audits to be conducted at regular intervals focused on asset operations, maintenance, health and safety and environment.	
		Adequacy Rating: Adequately defined (A)	**Performance Rating:** Performing effectively (1)

<table>
<tr><th>No</th><th>Effectiveness Criteria</th><th colspan="2">Findings</th></tr>
<tr><td>12(b)</td><td>Independent reviews (e.g. internal audit) are performed of the asset management system.</td><td colspan="2">Through discussion with Principal Mechanical Engineer WAO Powerhouse and examination of ASAT material, we determined that: Alcoa’s processes provide for: ASAT audits to be conducted by Alcoa’s Internal Audit team, which is independent of Alcoa’s asset management system, at three year intervals The audits’ findings to be reported to the Powerhouse Manager as well as the Energy Services Manager and used as preparation for the third party independent review. ASATs are particularly designed to address obligations relating to Alcoa’s performance audit and asset management system review The last scheduled ASAT audit was to be performed in 2014, however that audit was not undertaken Although elements of Alcoa’s AMS are subject to forms of monitoring and review (such as health and safety system reviews, licence compliance monitoring), those activities are not consolidated and recognised as part of an effective independent review of its Powerhouse AMS. Adequacy Rating: Adequately defined (A) | Performance Rating: Opportunity for improvement (2)</td></tr>
<tr><td></td><td colspan="2">Recommendation 5/2017
Alcoa:
(a) Reassess the relevance, scope and frequency of ASAT audits on its Powerhouse AMS
(b) Commit to either completing an ASAT audit, or to another suitable form of independent review of its Powerhouse AMS
(c) Document its approach to independent review of its Powerhouse AMS.</td><td>Action Plan 5/2017
Alcoa will:
(a) Reassess the relevance, scope and frequency of ASAT audits on its Powerhouse AMS
(b) Commit to either completing an ASAT audit, or to another suitable form of independent review of its Powerhouse AMS
(c) Document its approach to independent review of its Powerhouse AMS.
Responsible Person
Principal Mechanical Engineer WAO Powerhouse
Target Date
30 June 2018</td></tr>
</table>

5 Follow-up of previous review action plans

Reference (no./year)	(Asset management effectiveness rating/ AMS Component & Criteria / details of the issue)	Reviewer's Recommendation or action taken	Date Resolved	Further action required
A. Resolved before end of previous Review period				
N/A - The 2013 AMS Review report did not contain any recommendations or action plans which were resolved before the end of the previous review period.				
B. Resolved during current Review period				
1/2013	*Asset maintenance* *6(a) Maintenance policies and procedures are documented and linked to service levels required* Alcoa has documented policies, procedures and protocols for each site, designed to facilitate maintenance of Alcoa's assets. However, we observed that Alcoa is in the process of developing and enhancing its suite of maintenance documentation, including: • Documents detailing the required maintenance level for each specific plant item • Specific plant maintenance instructions for electrical and mechanical plant • Control plans for major plant items such as boiler, generator, deaerators and boiler feed pumps • Supplementary equipment asset strategies. We also noted that document management practices appear to be limited, as	Alcoa: a) Developed ITPs where thought to be necessary b) Rolled out use of ITPs, but considered formal staff training to be unnecessary (as ITPs were readily adopted) c) Conducted a review of its document filling process and considered it to be fit for purpose.	September 2014	N/A

Reference (no./year)	(Asset management effectiveness rating/ AMS Component & Criteria / details of the issue)	Reviewer's Recommendation or action taken	Date Resolved	Further action required
	documentation requested for during the review was not readily available/could be located.			
2/2013	*Asset maintenance* *6(c) Maintenance plans (emergency, corrective and preventative) are documented and completed on schedule* For each facility's major equipment, the eAM system contains plans for scheduled maintenance as well as required emergency and corrective works. However, based on our examination of Alcoa's maintenance practices, we determined that Inspection Test Procedures (**ITP**s) are currently being developed and uploaded into eAM. Of the ITPs that have been developed, only a small number are being used by Operations & Maintenance staff.	Alcoa: a) Developed ITPs where thought to be necessary b) Rolled out use of ITPs, but considered formal staff training to be unnecessary (as ITPs were readily adopted) c) Conducted a review of its document filling process and considered it to be fit for purpose.	September 2014	N/A
2/2010	*Asset disposal* *Asset disposal 3(d) There is a replacement strategy for assets* At the time of our review, the Asset Strategy documents for each of Alcoa's three powerhouses do not contain relevant asset replacement strategies.	Alcoa updated its Powerhouse Asset Strategies to provide for commentary on its asset replacement strategy.	July 2014	N/A
3/2010	*Capital expenditure* *Capital expenditure 11(c) The capital expenditure plan is consistent with the asset life and condition identified in the asset management plan* Capital expenditure 11(c) The capital expenditure plan is consistent with the asset life and condition identified in the asset management plan	Alcoa updated its Powerhouse Asset Strategies to provide reference for: a) The asset replacement strategy and life limiting mechanisms of key assets b) Capital expenditure as part of the key elements for asset management c) The requirement of supporting evidence and sound justification for project development and capital expenditure.	July 2014	N/A
C. Unresolved at end of current Review period				

Reference (no./year)	(Asset management effectiveness rating/ AMS Component & Criteria / details of the issue)	Reviewer's Recommendation or action taken	Date Resolved	Further action required
3/2013	*Risk management* *8(a) Risk management policies and procedures exist and are being applied to minimise internal and external risks associated with the asset management system.* There is no independent review of the Asset Management System which Alcoa referred to as the Wagerup Power Station SAMP. This was recommended in the previous audit issue 3/10.	Alcoa should update the Risk Management suite of documents to reflect the revised Risk Management standard AS/NZS ISO 31000:2009.	N/A	Yes - refer to carry-over finding 3/2013.

Appendix A – Review plan

Appendix B – References

Alcoa staff and representatives participating in the review

- Principal Mechanical Manager WAO Powerhouse
- Project Manager – Project Delivery (Wagerup)
- Energy Projects Manager
- Management Accountant (Kwinana)
- Environmental Scientist (Kwinana)
- Environmental Scientist (Pinjarra).

Deloitte staff participating in the review

		Hours
• Richard Thomas	Partner	6.5
• Andrew Baldwin	Specialist Leader	27
• David Herbert	Senior Analyst	61
• Emlyn King	Senior Analyst	9
• Tanuja Sanders*	Engineer	46
• Keith Sanders	Engineer (QA)	6
• Kobus Beukes	QA Partner	1

Key documents and other information sources examined

- A3 Project Approval Process
- A3 Project Approval Template
- Account Management Security Standard
- Annual Audit Compliance Report:
  - Kwinana
  - Pinjarra
  - Wagerup.
- Annual Environmental Review (Kwinana)
- Annual Environmental Review (Pinjarra)
- Application Recovery Plan (Enterprise Asset Management)
- Archive Data Management Procedure
- Asset Utilisation Reporting Model
- Blitz Project Scoping Process
- Boiler Cold Start/Recommission Process (Kwinana)
- Boiler Cooldown Process (Wagerup)
- Boiler Emissions Testing (Kwinana)
- Boiler Gas To Diesel Process (Kwinana)
- Business Recovery Plan (Pinjarra)
- Capital Review Report (Kwinana)
- Combustion Tuning Report – (Performed By MHI) Pinjarra)
- Combustor Inspection Report – (Performed By Mitsubishi Heavy Industries (MHI)) (Pinjarra)
- Commissioning and Handover Template
- Community Consultation Process

- Computer Centre Disaster Recovery Plan (Kwinana)
- Crisis Management and Recovery Manual (i.e. Emergency Response Procedure)(Kwinana)
- Diesel Burn Emissions Monitoring Process (Kwinana)
- Disaster Recovery Plan
- Emissions Test Report (Pinjarra)
- Environmental Aspects and Impacts Procedure
- Environmental Groundwater Monitoring Report (Kwinana)
- Environmental Health And Safety Risk Assessment (Kwinana)
- Environmental Health And Safety Risk Assessment (Pinjarra)
- Environmental Monitoring Dashboard
- Equipment Maintenance Strategy:
  - Boiler Feed Pumps (Kwinana)
  - Gas Turbines (Wagerup)
- Equipment Management Metrics Portal Screenshots
- Equipment Management Metrics Reports:
  - Late Critical Pm Compliance % (Wagerup)
  - Asset Residual Life (Kwinana).
- Expenditure Approval Policy and Procedure.
- Expense Control Report
  - Kwinana
  - Pinjarra
  - Wagerup
- Final Outage Report (Performed By Turbine Services Australia (TSA)) (Pinjarra)
- Flow Loss Report (Kwinana)
- Flow Loss Report (Wagerup)
- Gas Turbine Failure Presentation(Wagerup)
- Global Economic Model
- LMS Training Register
- LMS Training Screenshot
- Load Capacity Tests
- Maintenance 2 Year Plan (Wagerup)
- Major Incident Investigation And Reporting Process
- Monthly Watering Report (Kwinana)
- Network Share Drive Security Guidelines
- Noise Management Monitoring Screenshot (Wagerup)
- Noise Management Procedure (Wagerup)
- Noise Management Strategy (Wagerup)
- Pinjarra 'All In One Risk Summary
- Powerhouse Asset Hierarchy (Wagerup)
- Powerhouse Asset Register (Wagerup)
- Powerhouse Asset Strategies:
  - Kwinana
  - Pinjarra
  - Wagerup.
- Powerhouse Lead Team Meeting Minutes
- Powerhouse Safety Policy

- Powerhouse Training Report
- Project Change Control Form
- Project Change Control Procedure
- Request For Authorisation – 2015 Boiler Major Overhaul (Sample) (Pinjarra Site)
- Request for Authorisation Procedure
- Request for Authorisation Template
- Risk Assessment Management Summary:
  - Boiler Maintenance Deferral (Wagerup)
  - Turbine Maintenance Deferral (Kwinana).
- Risk Management Overview
- Risk Management Policy
- Risk Summary – Wagerup Refinery Works August 2015
- Smoke Charts (Kwinana)
- Stack Testing (Kwinana)
- Stack Testing (Wagerup)
- Steam Turbine ITP (Kwinana)
- Storage Vessel ITP (Pinjarra)
- Surplus Equipment Reporting Process.

Appendix C – Post review implementation plan

This plan has been prepared by Alcoa and does not form part of Deloitte's review findings.

Issue 1/2017

Asset planning: 1(a) Asset management plan covers key requirements.

Alcoa has developed a Powerhouse Asset Strategy for each of its Kwinana, Pinjarra and Wagerup Powerhouses, which serves as the overarching asset management plan for each of Alcoa's generation sites under the Licence.

Those Powerhouse Asset Strategies provide for diesel as an alternative fuel in the event of a shortage of gas. However,

- We are advised that Alcoa has modified its strategy for testing its capacity to changeover from gas to diesel firing. That strategy is not reflected in the Powerhouse Asset Strategies
- A diesel shelf-life monitoring program has not yet been established to outline Alcoa's requirements for managing/regularly testing diesel and monitoring diesel shelf-life.

The consequential impact of Alcoa's current approach to diesel use not being reflected in its Powerhouse Asset Strategies includes outdated:

- Maintenance activities. For example, a planned maintenance task to conduct routine Boiler Oil burns at the Kwinana powerhouse was listed as long overdue at 30 June 2017
- Contingency Plans.

Recommendation 1/2017	**Action Plan 1/2017**
Alcoa: (a) Update its Powerhouse Asset Strategies to reflect its current approach to diesel management and use (b) Implement a relevant diesel shelf-life monitoring program.	Alcoa will: (a) Update its Powerhouse Asset Strategies to reflect its current approach to diesel management and use (b) Implement a relevant diesel shelf-life monitoring program. **Responsible Person** Principal Mechanical Engineer WAO Powerhouse **Target Date** 30 June 2018

Issue 2/2017

Asset planning: 1(i) Plans are regularly reviewed and updated

Alcoa's Kwinana Powerhouse Asset Strategy provides for the strategy to be reviewed every two years. As the last review was performed in February 2015, the current review is overdue.

The Principal Mechanical Engineer WAO Powerhouse advised that Alcoa has reconsidered the appropriateness of the timeframe for reviewing the Kwinana Powerhouse Asset Strategy, to better align with the review timeframe applied to the Wagerup and Pinjarra Powerhouse Asset Strategies (every four and five years respectively).

Recommendation 2/2017	**Action Plan 2/2017**
Alcoa formally assess and, where necessary, amend the timeframe for reviewing its Powerhouse Asset Strategies.	Alcoa will formally assess and, where necessary, amend the timeframe for reviewing its Powerhouse Asset Strategies. **Responsible Person** Principal Mechanical Engineer WAO Powerhouse **Target Date** 30 June 2018

Issue 3/2017

Asset maintenance: 6(c) Maintenance plans (emergency, corrective and preventative) are documented and completed on schedule

Alcoa's prioritisation of maintenance work orders is based on its operational requirements (e.g. emergency and corrective works having higher priority), its statutory obligations and designation of critical assets.

Its EMMS portal also provides a strong capability for monitoring performance metrics such as the 'Late Critical Compliance %' metric, which reports details of overdue work orders relating to critical assets. The Principal Mechanical Engineer WAO Powerhouse also advised of Alcoa's intention to leverage its data and reporting capabilities to drive further maintenance efficiencies, which demonstrates a focus on continuous improvement in its approach to maintenance.

We recognise that Alcoa's work order planning and monitoring processes are driven by experienced staff/managers who are responsible for maintaining powerhouse reliability, however those processes can be further improved with more structured guidance on the relevant priority of maintenance tasks. By further distinguishing between lower and higher priority tasks, Alcoa will be better placed to complete the most critical maintenance within the required timeframes and to further improve efficiencies by minimising investment in lowest priority work orders.

Recommendation 3/2017	**Action Plan 3/2017**
Alcoa: (a) Investigate the capability of its work order planning and monitoring processes to introduce a further degree of work order prioritisation (b) Consider the potential to further rationalise the number of maintenance tasks assigned as critical (i.e. to re-assign with a lower priority).	Alcoa will: (a) Investigate the capability of its work order planning and monitoring processes to introduce a further degree of work order prioritisation (b) Consider the potential to further rationalise the number of maintenance tasks assigned as critical (i.e. to re-assign with a lower priority). **Responsible Person** Principal Mechanical Engineer WAO Powerhouse **Target Date** 30 June 2018

Issue 4/2017

Contingency planning: 9(a) Contingency plans are documented, understood and tested to confirm their operability and to cover higher risks.

Alcoa maintains Emergency Response Procedures (**ERP**s) for each refinery as a component of its suite of policies and procedures for contingency management.

We observed evidence of mock emergency response activities performed as part of refinery ERPs, and subject to review via ASAT audits. However Alcoa has not applied a coordinated approach to ensure its ERPs capture Alcoa's requirements for the method and frequency of test procedures.

Recommendation 4/2017	**Action Plan 4/2017**
Alcoa update its ERPs to provide for: • Frequency of testing • Method of testing • Required documentation/reporting outputs • A lessons learned mechanism.	Alcoa will update its ERPs to provide for: • Frequency of testing • Method of testing • Required documentation/reporting outputs • A lessons learned mechanism. **Responsible Person** Principal Mechanical Engineer WAO Powerhouse **Target Date** 30 June 2018

Issue 5/2017

Review of asset management system: 12(b) Independent reviews (e.g. internal audit) are performed of the asset management system.

Alcoa had established a program for Alcoa Self-Assessment Test (**ASAT**) audits on its Powerhouse AMS to be performed every three years by the Alcoa internal audit team.

The last scheduled ASAT audit was to be performed in 2014, however that audit was not undertaken.

Although elements of Alcoa's AMS are subject to forms of monitoring and review (such as health and safety system reviews, licence compliance monitoring), those activities are not consolidated and recognised as part of an effective independent review of its Powerhouse AMS.

Recommendation 5/2017	**Action Plan 5/2017**
Alcoa: (a) Reassess the relevance, scope and frequency of ASAT audits on its Powerhouse AMS (b) Commit to either completing an ASAT audit, or to another suitable form of independent review of its Powerhouse AMS (c) Document its approach to independent review of its Powerhouse AMS.	Alcoa will: (a) Reassess the relevance, scope and frequency of ASAT audits on its Powerhouse AMS (b) Commit to either completing an ASAT audit, or to another suitable form of independent review of its Powerhouse AMS (c) Document its approach to independent review of its Powerhouse AMS. **Responsible Person** Principal Mechanical Engineer WAO Powerhouse **Target Date** 30 June 2018

Issue 3/2013

Risk management: 8(a) Risk management policies and procedures exist and are being applied to minimise internal and external risks associated with the asset management system.

2013 AMS review report finding

We observed evidence of risk management activities being applied to WAO Powerhouse planning and management activities.

However, as a minor point to note, Alcoa's suite of risk management policies and procedures refers to the out-dated Risk Management Australian standard AS/NZS 4360:2004. The new risk management standard AS/NZS ISO 31000:2009, although not fundamentally different to the old standard, has been updated including a new definition of risk and provides a greater emphasis on how risk management should be implemented and integrated into an organisation.

Current status

At the time of this review, the Action Plan had not been completed by the 30 June 2014 target date. Therefore, the finding remains relevant to the current review period.

Recommendation 3/2013 (per 2013 AMS review report)	**Action Plan 3/2013**
Alcoa update the Risk Management suite of documents to reflect the revised Risk Management standard AS/NZS ISO 31000:2009.	Alcoa will update its risk management suite of documentation to reflect the revised Risk Management standard. **Responsible Person** Principal Mechanical Engineer WAO Powerhouse **Target Date** 30 June 2018