Alcoa of Australia Limited

Electricity Generation Licence (EGL14)
2022 Asset Management System Review

Final report

October 2022

ASSURANCE
ADVISORY
GROUP

Level 11, 251 Adelaide Terrace
PERTH WA 6000

26 October 2022

Nick Eaton
Energy Manager - Australia
Alcoa of Australia
181-205 Davy Street
BOORAGOON WA

Dear Nick

Electricity Generation Licence (EGL14) – 2022 Asset Management System Review report

We have completed the Electricity Generation Licence Asset Management System Review for Alcoa of Australia Limited for the period 1 July 2017 to 30 June 2022 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 at abaldwin@assuranceadvisory.com.au or myself at slinden@assuranceadvisory.com.au.

Yours sincerely
Assurance Advisory Group

[redacted]

Stephen Linden
Director
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1. Independent assurance practitioner's report

Modified conclusion

We have undertaken a limited assurance engagement on the effectiveness of Alcoa of Australia Limited's Asset Management System (**AMS**), relating to its Electricity Generation Licence (EGL14 (the **Licence**) for the period 1 July 2017 to 30 June 2022 (**review period**).

In our opinion, based on the procedures we have performed and the evidence we have obtained, except for the effects of the matters described in the Basis for modified opinion paragraph below, nothing has come to our attention that causes us to believe Alcoa has not established and maintained, in all material respects, an effective AMS for assets subject to the Licence, as measured by the effectiveness criteria in the March 2019 issue of the *Audit and Review Guidelines: Electricity and Gas Licences* (**the Guidelines**) issued by the Economic Regulation Authority (the **ERA**) and that the systems have not operated effectively for the review period.

Basis for modified conclusion

During the period 1 July 2017 to 30 June 2022, Alcoa's asset management system had the following deficiencies that require correction or improvement in order to address the effectiveness criteria nominated in the Guidelines:

Key process & effectiveness criteria	Description
4. Environmental analysis 4.2 Performance standards (availability of service, capacity, continuity, emergency response, etc.) are measured and achieved **6. Asset Maintenance** 6.5 Risk management is applied to prioritise maintenance tasks	Each of Alcoa's Powerhouses had consistently not met target maintenance performance during the audit period. The Pinjarra Powerhouse achieved only half of the target for the 'Late Critical Compliance %' metric (which reports details of overdue work orders relating to critical assets), due to lack of resources and some miscommunication between the mobile maintainer and Alcoa's enterprise Asset Management system. At the time of this review, work relating to standardising procedures for Electrical Power Distribution assets for all three Powerhouses was underway and numerous work orders have been raised in relation to tracking completion of this work. Nevertheless, a backlog of works indicates an increasing trend towards failure in the work order management processes.
5. Asset operations 5.6 Staff resources are adequate and staff receive training commensurate with their responsibilities	The following factors indicate staffing levels have not been sufficient for maintaining control of the maintenance works management processes: • An increasing backlog of maintenance tasks and overdue work orders for each Powerhouse, particularly critical tasks at Pinjarra • Recent turnover in key leadership staff at the Pinjarra and Wagerup sites • Some improvement opportunities identified in 2017 risk registers remain open.

Key process & effectiveness criteria	Description
6. Asset operations 6.3 Maintenance plans (emergency, corrective and preventative) are documented and completed on schedule	In light of the increasing backlog of maintenance works at all three sites (especially at Pinjarra), there is an increasing need for more concentrated effort in the allocation of resources, including the use contractors and specialist companies that can assist in diagnosing maintenance works for aging assets. This issue is essentially a symptom of the issues raised at 4.2 (relating to performance standards) and 5.6 (relating to staff resources).

We conducted our engagement in accordance with Standard on Assurance Engagements ASAE 3500 *Performance Engagements* (**ASAE 3500**) issued by the Auditing and Assurance Standards Board.

We believe that the evidence we have obtained is sufficient and appropriate to provide a basis for our conclusion.

Alcoa's responsibility for the AMS

Alcoa is responsible for ensuring that it has:

- Complied in all material respects with the requirements of the Licence as specified by the Review Guidelines
- Established and maintained an effective AMS for assets subject to the Licence, as measured by the effectiveness criteria detailed in the Guidelines.

Our independence and quality control

We have complied with the independence and other relevant ethical requirements relating to assurance engagements, which are founded on fundamental principles of integrity, objectivity, professional competence and due care, confidentiality and professional behaviour. We applied Auditing Standard ASQC 1 *Quality Control for Firms that Perform Audits and Reviews of Financial Reports and Other Financial Information, and Other Assurance Engagements* in undertaking this assurance engagement.

Our responsibilities

Our responsibility is to express a limited assurance conclusion on the effectiveness of Alcoa's AMS for assets subject to the Licence for the period 1 July 2017 to 30 June 2022, based on the procedures we have performed and the evidence we have obtained. We conducted our limited assurance engagement in accordance with ASAE 3500, in order to express a conclusion whether, based on the procedures performed and the evidence obtained, anything has come to our attention that causes us to believe that Alcoa's AMS for assets subject to the Licence, have not been established and maintained, in all material respects.

A limited assurance engagement conducted in accordance with ASAE 3500 involves identifying areas where the AMS for assets subject to a Licence is likely to be materially ineffective, addressing the areas identified and considering the process used to prepare the AMS for assets subject to the Licence. A limited assurance engagement is substantially less in scope than a reasonable assurance engagement in relation to both the risk assessment procedures, including an understanding of internal control, and the procedures performed in response to the assessed risks.

Procedures performed

The procedures we performed were based on our professional judgement and consisted primarily of:

- Utilising the Review Guidelines as a guide for development of a risk assessment, which involved discussions with key staff and review of documents to perform a preliminary controls assessment
- Development of a Review Plan for approval by the ERA, and an associated work program
- Interviews with and representations from Alcoa representatives and key operational and administrative staff to gain an understanding of the development and maintenance of policies and procedural type documentation. A full list of staff engaged has been provided at Appendix B
- 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 operations located at Kwinana, Wagerup and Pinjarra
- Consideration of reports and references evidencing activity
- Consideration of activities performed by Alcoa that relate to operation of the assets.

The procedures performed in a limited assurance engagement vary in nature and timing from, and are less in extent than for, a reasonable assurance engagement. Consequently, the level of assurance obtained in a limited assurance engagement is substantially lower than the assurance that would have been obtained had we performed a reasonable assurance engagement. Accordingly, we do not express a reasonable assurance opinion on the effectiveness of Alcoa's AMS for assets subject to the Licence.

Inherent Limitations

Because of the inherent limitations of an assurance engagement, together with the inherent limitation of any system of controls it is possible that fraud, error or non-compliance with the requirements of the Guidelines may occur and not be detected.

A reasonable assurance engagement relating to the period from 1 July 2017 to 30 June 2022 does not provide assurance on whether the effectiveness of Alcoa's AMS for assets subject to the Licence will continue in the future.

Restricted use

This report has been prepared for use by Alcoa for the purpose of satisfying its obligation under Section 14 of the Electricity Industry Act 2004. We disclaim any assumption of responsibility for any reliance on this report to any person other than Alcoa, or for any other purpose other than that for which it was prepared. 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 will be given to the ERA in connection with this purpose, however we accept no responsibility to the ERA or to anyone who is provided with or obtains a copy of our report.

Yours sincerely
Assurance Advisory Group

Stephen Linden
Director
26 October 2022

2. Executive Summary

2.1 Introduction and Background

The Economic Regulation Authority (the **ERA**) has under the provisions of the Electricity Industry Act 2004 (the **Act**), issued to Alcoa of Australia Limited (**Alcoa**) an Electricity Generation Licence (EGL14) (the **Licence**).

The Licence relates to Alcoa's operation of electricity generation works at its Kwinana, Pinjarra and Wagerup facilities. These works are managed by Alcoa's WA powerhouse operations within the WA Operations 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.

Section 14 of the Act requires Alcoa to provide to the ERA an asset management system review (the **review**) report conducted by an independent expert acceptable to the ERA not less than once in every 24-month period unless otherwise approved by the ERA. With the ERA's approval, Assurance Advisory Group (**AAG**) has been appointed to conduct the review for the period 1 July 2017 to 30 June 2022 (**review period**).

The review has been conducted in accordance with the ERA's March 2019 issue of the *Audit and Review Guidelines: Electricity and Gas Licences* (**Review Guidelines**), which set out 12 key processes in the asset management life-cycle.

2.2 Findings

In considering Alcoa's internal control procedures, structure and environment, compliance arrangements and 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
- Alcoa 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
- Alcoa staff appeared to have a full working understanding of their roles, particularly displaying an understanding of the asset management principles and processes within their area of responsibility
- Alcoa utilises data and dashboard reporting through the Equipment Management Metrics (**EMM**) portal to identify trends in asset condition and maintenance performance
- Four elements of Alcoa's asset management practices require improvement (where the criteria's performance rating is "3"). Each of those four elements are impacted by the challenges Alcoa has faced in resourcing and completing its maintenance works, resulting in an increasing backlog of maintenance tasks and overdue work orders. This review makes two recommendations for Alcoa to determine and implement the necessary corrective actions (refer to Recommendations 1/2022 and 2/2022).

  We acknowledge that Alcoa is currently assessing the outcomes of a broad review of its WA Powerhouse operations, including a review of the effectiveness and sustainability of current maintenance strategies required for Alcoa to continue to achieve its high powerhouse utilisation performance. The resulting actions are expected to improve those asset management practices highlighted by this review

- There are two further minor improvement opportunities to strengthen aspects of its asset management practices, as described throughout this report (where criteria are rated as "B" or "2")). In those instances, we raised the potential improvement opportunity with Alcoa staff.

This review assessed that, of the 58 elements of Alcoa's AMS:

- For the asset management process and policy definition ratings:
  - 51 are rated as "Adequately defined"
  - 6 are rated as "Requires some improvement"
  - 1 is not rated.
- For the asset management performance ratings:
  - 51 are rated as "Performing effectively"
  - 1 is rated as "Improvement required"
  - 4 are rated as "Corrective action required"
  - 2 are not rated.

2.3 Alcoa's response to previous review recommendations

This review considered Alcoa's progress against the six outstanding recommendations from the 2017 review, being recommendations 1/2017, 2/2017, 3/2017, 4/2017, 5/2017 and 3/2013.

A. Resolved during current review period

Based on our examination of relevant documents, discussion with staff and consideration of the results of this review's testing against the criteria, we confirmed that recommendations 1/2017, 2/2017, 3/2017, 4/2017 and 5/2017 were actioned and effectively closed out throughout the period 2018 to 2021. No further recommendations are made in relation to these matters.

B. Unresolved at end of current review period

Recommendation 3/2013 has not yet been formally closed-out. Although Alcoa had initiated a review of its overarching risk management procedures in 2021, the results of that review have not yet been finalised and reflected in local policy and procedures. As this matter remains a relatively minor matter to be closed-out (rated as B1), no further recommendation is made by this review.

Refer to section 5 "Status of recommendations addressing asset system deficiencies from the previous review" for further detail.

2.4 Recommendations to address current asset system deficiencies

A. Resolved during current review period

Not applicable.

B. Unresolved at end of current review period

Reference (no./year)	**Process and policy deficiency / Performance deficiency** (Rating / Reference number, Asset management process & effectiveness criterion / Details of deficiency)	**Auditor's recommendation**	**Action taken**
1/2022	**B3** 4. Environmental Analysis *4.2 Performance standards (availability of service, capacity, continuity, emergency response, etc.) are measured and achieved* 6. Asset Maintenance *6.5 Risk management is applied to prioritise maintenance tasks* Each of Alcoa's Powerhouses had consistently not met target maintenance performance during the audit period. The Pinjarra Powerhouse achieved only half of the target for the 'Late Critical Compliance %' metric (which reports details of overdue work orders relating to critical assets), due to lack of resources and some miscommunication between the mobile maintainer and Alcoa's eAM system. Work relating to standardising procedures for Electrical Power Distribution assets for all three Powerhouses was underway and numerous work orders have been raised in relation to tracking completion of this work. Nevertheless, a backlog of works indicates an increasing trend towards failure in the work order management processes	Alcoa: (a) Review the implications of the continued trend towards failure in its work order management processes (b) Determine any further appropriate corrective action.	n/a
2/2022	**B3** 5. Asset Operations *5.6 Staff resources are adequate and staff receive training commensurate with their responsibilities* The following factors indicate staffing levels have not been sufficient for maintaining control of the maintenance works management processes: • An increasing backlog of maintenance tasks and overdue work orders for each Powerhouse, particularly critical tasks at Pinjarra • Recent turnover in key leadership staff at the Pinjarra and Wagerup sites • Some improvement opportunities identified in 2017 risk registers remain open.	Alcoa establish an action plan to debottleneck the current backlog of work orders and to regain full control of its asset management and maintenance works processes.	n/a
1/2022 And 2/2022	**B3** 6. Asset Maintenance *6.3 Maintenance plans (emergency, corrective and preventative) are documented and completed on schedule* In light of the increasing backlog of maintenance works at all three sites (especially at Pinjarra), there is an increasing need for more concentrated effort in the allocation of resources, including the use contractors and specialist companies that can assist in diagnosing maintenance works for aging assets. This issue is essentially a symptom of the issues raised at 4.2 (relating to performance standards) and 5.6 (relating to staff resources).	Refer to Recommendations 1/2022 and 2/2022	n/a

2.5 Scope and objectives

We have conducted a limited assurance engagement in order to express a conclusion whether, based on the procedures performed and the evidence obtained, anything has come to our attention that causes us to believe Alcoa has not established and maintained, in all material respects, an effective AMS for assets subject to the Licence during the period 1 July 2017 to 30 June 2022, as measured by the effectiveness criteria in the Guidelines.

Our engagement was conducted in accordance with Australian Standard on Assurance Engagements ASAE 3500 Performance Engagements, issued by the Australian Auditing and Assurance Standards Board and provides limited assurance as defined in ASAE 3500. The procedures we performed are described in more detail in section 2.6 below.

A limited assurance engagement in accordance with ASAE 3500, to report on the effectiveness of Alcoa's AMS for assets subject to the Licence involves performing procedures to obtain evidence about processes and controls designed and implemented within Alcoa's AMS for assets subject to the Licence. The procedures selected depend on our judgement, including the identification and assessment of risks of Alcoa's AMS for assets subject to a Licence being materially ineffective.

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

In accordance with the Review Guidelines, the review considered the effectiveness of Alcoa's existing control procedures within the following 12 key processes in the asset management life cycle:

Key processes	Effectiveness criteria
1. Asset Planning	1.1 Asset management plan covers the processes in this table 1.2 Planning processes and objectives reflect the needs of all stakeholders and are integrated with business planning 1.3 Service levels are defined in the asset management plan 1.4 Non-asset operations (e.g. demand management) are considered 1.5 Lifecycle costs of owning and operating assets are assessed 1.6 Funding options are evaluated 1.7 Costs are justified and cost drivers identified 1.8 Likelihood and consequences of asset failure are predicted 1.9 Asset management plan is regularly reviewed and updated.
2. Asset creation and acquisition	2.1 Full project evaluations are undertaken for new assets, including comparative assessment of non-asset options 2.2 Evaluations include all life-cycle costs 2.3 Projects reflect sound engineering and business decisions 2.4 Commissioning tests are documented and completed 2.5 Ongoing legal / environmental / safety obligations of the asset owner are assigned and understood
3. Asset disposal	3.1 Under-utilised and under-performing assets are identified as part of a regular systematic review process 3.2 The reasons for under-utilisation or poor performance are critically examined and corrective action or disposal undertaken 3.3 Disposal alternatives are evaluated 3.4 There is a replacement strategy for assets

Key processes	Effectiveness criteria
4. Environmental analysis	4.1 Opportunities and threats in the asset management system environment are assessed 4.2 Performance standards (availability of service, capacity, continuity, emergency response, etc.) are measured and achieved 4.3 Compliance with statutory and regulatory requirements 4.4 Service standard (customer service levels etc) are measured and achieved.
5. Asset operations	5.1 Operational policies and procedures are documented and linked to service levels required 5.2 Risk management is applied to prioritise operations tasks 5.3 Assets are documented in an asset register including asset type, location, material, plans of components, and an assessment of assets' physical/structural condition 5.4 Accounting data is documented for assets [new criteria] 5.5 Operational costs are measured and monitored 5.6 Staff resources are adequate and staff receive training commensurate with their responsibilities
6. Asset maintenance	6.1 Maintenance policies and procedures are documented and linked to service levels required 6.2 Regular inspections are undertaken of asset performance and condition 6.3 Maintenance plans (emergency, corrective and preventative) are documented and completed on schedule 6.4 Failures are analysed and operational/maintenance plans adjusted where necessary 6.5 Risk management is applied to prioritise maintenance tasks 6.6 Maintenance costs are measured and monitored
7. Asset management information systems	7.1 Adequate system documentation for users and IT operators 7.2 Input controls include suitable verification and validation of data entered into the system 7.3 Security access controls appear adequate, such as passwords 7.4 Physical security access controls appear adequate 7.5 Data backup procedures appear adequate and backups are tested 7.6 Computations for licensee performance reporting are accurate 7.7 Management reports appear adequate for the licensee to monitor licence obligations 7.8 Adequate measures to protect asset management data from unauthorised access or theft by persons outside the organisation [new criteria]
8. Risk management	8.1 Risk management policies and procedures exist and are applied to minimise internal and external risks 8.2 Risks are documented in a risk register and treatment plans are implemented and monitored 8.3 Probability and consequences of asset failure are regularly assessed
9. Contingency planning	9.1 Contingency plans are documented, understood and tested to confirm their operability and to cover higher risks

Key processes	Effectiveness criteria
10. Financial planning	10.1 The financial plan states the financial objectives and identifies strategies and actions to achieve those 10.2 The financial plan identifies the source of funds for capital expenditure and recurrent costs 10.3 The financial plan provides projections of operating statements (profit and loss) and statement of financial position (balance sheets) 10.4 The financial plan provides firm predictions on income for the next five years and reasonable predictions beyond this period 10.5 The financial plan provides for the operations and maintenance, administration and capital expenditure requirements of the services 10.6 Large variances in actual/budget income and expenses are identified and corrective action taken where necessary
11. Capital expenditure planning	11.1 There is a capital expenditure plan covering works to be undertaken, actions proposed, responsibilities and dates 11.2 The capital expenditure plan provides reasons for capital expenditure and timing of expenditure 11.3 The capital expenditure plan is consistent with the asset life and condition identified in the asset management plan 11.4 There is an adequate process to ensure the capital expenditure plan is regularly updated and implemented
12. Review of asset management system	12.1 A review process is in place to ensure the asset management plan and the asset management system described in it remain current 12.2 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 review 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 July to August 2022:

- 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 an understanding of process controls in place (see Appendix B for staff involved)
- Site visit to the Kwinana, Wagerup and Pinjarra Powerhouse Facilities, with a focus on understanding the generation assets, their function, normal mode of operation, age and an assessment of the facilities against the AMS review criteria
- Examination of documented policies and procedures for key functional requirements and consideration of their relevance to Alcoa's AMS requirements and standards (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.

3. Summary of Ratings

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

Table 1: Process and policy rating scale

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 being managed
B	Requires some improvement	• Processes and policies require 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) requires minor improvements (taking into consideration the assets being managed)
C	Requires substantial improvement	• Processes and policies are incomplete or require substantial improvement • Processes and policies do not document the required performance of the assets • Processes and policies are considerably out of date • The asset management information system(s) requires substantial improvements (taking into consideration the assets 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 being managed).

Table 2: Performance rating scale

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	Improvement required	• The performance of the process requires some improvement to meet the required level • Process effectiveness reviews are not performed regularly enough • Recommended process improvements are not implemented
3	Corrective action required	• The performance of the process requires substantial improvement to meet the required level • Process effectiveness reviews are performed irregularly, or not at all • Recommended process improvements are not implemented
4	Serious action required	• Process is not performed, or the performance is so poor 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 rating
  - Asset management performance rating.
- Detailed findings, including relevant observations and recommendations (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	Asset management process and effectiveness criteria	Review priority	Process and policy	Performance
1. Asset Planning			**A**	**1**
1.1	Asset management plan covers the processes in this table	Priority 4	A	1
1.2	Planning processes and objectives reflect the needs of all stakeholders and is integrated with business planning	Priority 4	A	1
1.3	Service levels are defined in the asset management plan	Priority 4	A	1
1.4	Non-asset operations (e.g. demand management) are considered	Priority 5	A	1
1.5	Lifecycle costs of owning and operating assets are assessed	Priority 5	A	1
1.6	Funding options are evaluated	Priority 5	A	1
1.7	Costs are justified and cost drivers identified	Priority 5	A	1
1.8	Likelihood and consequences of asset failure are predicted	Priority 2	A	1
1.9	Asset management plan is regularly reviewed and updated.	Priority 5	A	1
2. Asset creation and acquisition			**A**	**1**
2.1	Full project evaluations are undertaken for new assets, including comparative assessment of non-asset options	Priority 4	A	1
2.2	Evaluations include all life-cycle costs	Priority 4	A	1
2.3	Projects reflect sound engineering and business decisions	Priority 4	A	1
2.4	Commissioning tests are documented and completed	Priority 4	A	1
2.5	Ongoing legal / environmental / safety obligations of the asset owner are assigned and understood	Priority 4	A	1
3. Asset disposal			**A**	**1**
3.1	Under-utilised and under-performing assets are identified as part of a regular systematic review process	Priority 4	A	1
3.2	The reasons for under-utilisation or poor performance are critically examined and corrective action or disposal undertaken	Priority 5	A	1
3.3	Disposal alternatives are evaluated	Priority 5	A	Not rated
3.4	There is a replacement strategy for assets	Priority 4	A	1

Ref	Asset management process and effectiveness criteria	Review priority	Ratings	
			Process and policy	Performance
4. Environmental analysis			**B**	**3**
4.1	Opportunities and threats in the asset management system environment are assessed	Priority 4	B	2
4.2	Performance standards (availability of service, capacity, continuity, emergency response, etc.) are measured and achieved	Priority 4	B	3
4.3	Compliance with statutory and regulatory requirements	Priority 4	A	1
4.4	Service standard (customer service levels etc) are measured and achieved.	Priority 4	A	1
5. Asset operations			**B**	**3**
5.1	Operational policies and procedures are documented and linked to service levels required	Priority 4	A	1
5.2	Risk management is applied to prioritise operations tasks	Priority 4	A	1
5.3	Assets are documented in an asset register including asset type, location, material, plans of components, and an assessment of assets' physical/structural condition	Priority 4	A	1
5.4	Accounting data is documented for assets [new criteria]	Priority 4	A	1
5.5	Operational costs are measured and monitored	Priority 4	A	1
5.6	Staff resources are adequate and staff receive training commensurate with their responsibilities	Priority 4	B	3
6. Asset maintenance			**B**	**3**
6.1	Maintenance policies and procedures are documented and linked to service levels required	Priority 4	A	1
6.2	Regular inspections are undertaken of asset performance and condition	Priority 2	A	1
6.3	Maintenance plans (emergency, corrective and preventative) are documented and completed on schedule	Priority 2	B	3
6.4	Failures are analysed and operational/maintenance plans adjusted where necessary	Priority 2	A	1
6.5	Risk management is applied to prioritise maintenance tasks	Priority 4	B	3
6.6	Maintenance costs are measured and monitored	Priority 4	A	1
7. Asset management information systems			**A**	**1**
7.1	Adequate system documentation for users and IT operators	Priority 5	A	1
7.2	Input controls include suitable verification and validation of data entered into the system	Priority 4	A	1
7.3	Security access controls appear adequate, such as passwords	Priority 5	A	1
7.4	Physical security access controls appear adequate	Priority 5	A	1
7.5	Data backup procedures appear adequate and backups are tested	Priority 4	A	1
7.6	Computations for licensee performance reporting are accurate	Priority 5	Not rated	Not rated

Ref	Asset management process and effectiveness criteria	Review priority	Ratings	
			Process and policy	Performance
7.7	Management reports appear adequate for the licensee to monitor licence obligations	Priority 5	A	1
7.8	Adequate measures to protect asset management data from unauthorised access or theft by persons outside the organisation	Priority 4	A	1
8. Risk management			**A**	**1**
8.1	Risk management policies and procedures exist and are applied to minimise internal and external risks	Priority 4	B	1
8.2	Risks are documented in a risk register and treatment plans are implemented and monitored	Priority 4	A	1
8.3	Probability and consequences of asset failure are regularly assessed	Priority 2	A	1
9. Contingency planning			**A**	**1**
9.1	Contingency plans are documented, understood and tested to confirm their operability and to cover higher risks	Priority 2	A	1
10. Financial planning			**A**	**1**
10.1	The financial plan states the financial objectives and identifies strategies and actions to achieve those	Priority 4	A	1
10.2	The financial plan identifies the source of funds for capital expenditure and recurrent costs	Priority 5	A	1
10.3	The financial plan provides projections of operating statements (profit and loss) and statement of financial position (balance sheets)	Priority 5	A	1
10.4	The financial plan provides firm predictions on income for the next five years and reasonable predictions beyond this period	Priority 5	A	1
10.5	The financial plan provides for the operations and maintenance, administration and capital expenditure requirements of the services	Priority 5	A	1
10.6	Large 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**
11.1	There is a capital expenditure plan covering works to be undertaken, actions proposed, responsibilities and dates	Priority 4	A	1
11.2	The capital expenditure plan provides reasons for capital expenditure and timing of expenditure	Priority 5	A	1
11.3	The capital expenditure plan is consistent with the asset life and condition identified in the asset management plan	Priority 5	A	1
11.4	There is an adequate process to ensure the capital expenditure plan is regularly updated and implemented	Priority 5	A	1
12. Review of asset management system			**A**	**1**
12.1	A review process is in place to ensure the asset management plan and the asset management system described in it remain current	Priority 5	A	1
12.2	Independent reviews (e.g. internal audit) are performed of the asset management system	Priority 5	A	1

4. Detailed findings and recommendations

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.

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 Process and Policy/Performance rating: Adequately defined (A) / Performing effectively (1)

Effectiveness criteria	Findings	

1.1 Asset management plan covers the processes in this table	Through discussion with the WA Operations Powerhouse Manager, Senior Powerhouse Mechanical Engineer and Senior Electrical Engineer, Powerhouse; and examination of the Pinjarra, Wagerup and Kwinana Powerhouse Asset Strategies and supporting Asset Management Strategies, we determined that:
	• Alcoa has maintained 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)
	  ○ Vision, function and operating strategy
	  ○ Major equipment history and nameplate capacity
	  ○ Risks, Issues and Contingency arrangements
	  ○ Maintenance strategy
	  ○ Major projects
	  ○ Staff training requirements
	  ○ Environmental considerations.
	• In response to recommendations of the 2017 AMS review, Alcoa updated its Asset Strategies to reflect its use of diesel as an alternate fuel in the event of a shortage of gas.	

	Process and Policy Rating: Adequately defined (A)	**Performance Rating:** Performing effectively (1)

Effectiveness criteria	Findings	
1.2 Planning processes and objectives reflect the needs of all stakeholders and is integrated with business planning	Through discussion with the WA Operations Powerhouse Manager, Senior Powerhouse Mechanical Engineer and Senior Electrical Engineer, Powerhouse; and examination of the Pinjarra, Wagerup and Kwinana Powerhouse Asset Strategies and relevant documentation relating to Alcoa's planning processes, we determined that Alcoa continued to apply the following practices during the review period: • 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.	
	Process and Policy Rating: Adequately defined (A)	**Performance Rating:** Performing effectively (1)
1.3 Service levels are defined in the asset management plan	Through discussion with the Senior Powerhouse Mechanical Engineer and Senior Electrical Engineer, Powerhouse; and examination of the Pinjarra, Wagerup and Kwinana Powerhouse Asset Strategies and relevant documentation relating to Alcoa's planning processes, we determined that Alcoa continued to apply the following practices during the review period: • The WA Operations 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.	
	Process and Policy Rating: Adequately defined (A)	**Performance Rating:** Performing effectively (1)

Effectiveness criteria	Findings	
1.4 Non-asset operations (e.g. demand management) are considered	Through discussion with the Senior Powerhouse Mechanical Engineer and Senior Electrical Engineer, Powerhouse; and examination of the Pinjarra, Wagerup and Kwinana Powerhouse Asset Strategies and relevant documentation relating to Alcoa's planning processes, we determined that Alcoa continued to apply the following practices during the review period: • Alcoa's Expenditure Approval Policy and Procedure outlines 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 continued to opt for asset-based solutions during the review period.	
	Process and Policy Rating: Adequately defined (A)	**Performance Rating:** Performing effectively (1)
1.5 Lifecycle costs of owning and operating assets are assessed	Through discussion with the Senior Powerhouse Mechanical Engineer and Senior Electrical Engineer, Powerhouse; and examination of Alcoa's Expenditure Approval Policy and Procedure, RfA template and economic evaluation model, we determined that Alcoa continued to apply the following practices during the review period: • 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, Net Present Value 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.	
	Process and Policy Rating: Adequately defined (A)	**Performance Rating:** Performing effectively (1)

Effectiveness criteria	Findings	
1.6 Funding options are evaluated	Through discussion with the Senior Powerhouse Mechanical Engineer and Senior Electrical Engineer, Powerhouse; and consideration of Alcoa's planning and expenditure authorisation processes, we determined that Alcoa continued to apply the following practices during the review period: • 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.	
	Process and Policy Rating: Adequately defined (A)	**Performance Rating:** Performing effectively (1)
1.7 Costs are justified and cost drivers identified	Through discussion with the Senior Powerhouse Mechanical Engineer and Senior Electrical Engineer, Powerhouse; and consideration of Alcoa's asset planning processes, we determined that Alcoa continued to apply the following practices during the review period: • 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.	
	Process and Policy Rating: Adequately defined (A)	**Performance Rating:** Performing effectively (1)

Effectiveness criteria	Findings	
1.8 Likelihood and consequences of asset failure are predicted	Through discussion with the WA Operations Powerhouse Manager, Senior Powerhouse Mechanical Engineer and Senior Electrical Engineer, Powerhouse; and review of relevant supporting documentation, we observed that during the review period, Alcoa applied the following asset planning mechanisms to predict the likelihood and consequence of powerhouse asset failure: • The management and maintenance of powerhouse assets is reviewed on a day-to-day basis at an operational level and on an annual basis, primarily through the review of Powerhouse Asset Strategies and supporting Asset Management Strategies • An Equipment Integrity 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, which is reported to relevant Alcoa of Australia and Alcoa Global personnel in the quarterly AWA Global Refining Power report • Loss prevention inspections are performed to identify mechanical and electrical equipment breakdown exposures that could result in a major loss and to discuss proposed options to reduce or eliminate those exposures • Classified plant inspections are performed in accordance with the statutory requirements imposed upon the powerhouses, 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 • Condition monitoring techniques are employed on a frequent basis to identify defects. We sighted a full list of unplanned outages and asset reliability issues occurring at each site during the review period, plus a sample of supporting evidence relating to unplanned outages, power distribution disturbances, boiler reliability issues and turbine reliability issues.	
	Process and Policy Rating: Adequately defined (A)	**Performance Rating:** Performing effectively (1)

Effectiveness criteria	Findings	
1.9 Asset management plan is regularly reviewed and updated.	Through discussion with the WA Operations Powerhouse Manager and examination Powerhouse Asset Strategies and supporting Asset Management Strategies, 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 • 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. As such, the strategies detail equipment refurbishment or replacement requirements, as needed • Alcoa's processes require Powerhouse Asset Strategies to be reviewed for the: o Wagerup site, every four years (last updated November 2021) o Pinjarra site, every five years (last updated July 2021) o Kwinana site, every four years (last updated January 2022).	
	Process and Policy Rating: Adequately defined (A)	**Performance Rating:** Performing effectively (1)

4.2 Asset creation and acquisition

Key process: Asset creation/acquisition is the provision or improvement of assets

Expected outcome: The asset acquisition framework is economic, efficient and cost-effective; it reduces demand for new assets, lowers service costs and improves service delivery

Overall Process and Policy/Performance rating: Adequately defined (A) / Performing effectively (1)

<table>
<tr><th>Effectiveness criteria</th><th colspan="2">Findings</th></tr>
<tr><td rowspan="2">2.1 Full project evaluations are undertaken for new assets, including comparative assessment of non-asset solutions</td><td colspan="2">Through discussion with the WA Powerhouse Head of Operations and Senior Powerhouse Mechanical Engineer; and consideration of Alcoa’s planning and expenditure authorisation processes and procedures, we determined that Alcoa continued to apply the following practices to capital projects undertaken during the review period:
Full project evaluations are a requirement of Alcoa’s Expenditure Approval Policy and funds authorisation process, undertaken by means of completing and submitting the required 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 continued to opt for asset-based solutions during the review period.</td></tr>
<tr><td>Process and Policy Rating: Adequately defined (A)</td><td>Performance Rating: Performing effectively (1)</td></tr>
<tr><td rowspan="2">2.2 Evaluations include all life-cycle costs</td><td colspan="2">Through discussion with the Senior Powerhouse Mechanical Engineer and consideration of Alcoa’s planning and expenditure authorisation processes and procedures, we determined that Alcoa continued to apply the following practices to capital projects undertaken during the review period:
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 Alcoa Global and Alcoa of Australia, including identifying the source of funds. Project evaluations are developed by obtaining input from a range of Alcoa personnel, including engineering, finance, environmental and health and safety personnel.</td></tr>
<tr><td>Process and Policy Rating: Adequately defined (A)</td><td>Performance Rating: Performing effectively (1)</td></tr>
</table>

Effectiveness criteria	Findings	
2.3 Projects reflect sound engineering and business decisions	Through discussion with the Senior Powerhouse Mechanical Engineer and consideration of Alcoa's planning and expenditure authorisation processes and procedures, we determined that Alcoa has the following processes in place to manage the assessment of projects: • 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 capital projects with a value greater than AUD$1 million.	
	Process and Policy Rating: Adequately defined (A)	**Performance Rating:** Performing effectively (1)
2.4 Commissioning tests are documented and completed	Through discussion with the Senior Powerhouse Mechanical Engineer and consideration 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 Senior Powerhouse Mechanical Engineer.	
	Process and Policy Rating: Adequately defined (A)	**Performance Rating:** Performing effectively (1)

Effectiveness criteria	Findings	
2.5 Ongoing legal/environmental/safety obligations of the asset owner are assigned and understood.	Through discussion with the Senior Powerhouse Mechanical Engineer and Senior Electrical Engineer, Powerhouse; and examination of Alcoa's documented policies and procedures, we determined that Alcoa continued to apply appropriate processes 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 • 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 Assessments for Pinjarra, Wagerup and Kwinana Powerhouses • WA Operations training requirements listing.	
	Process and Policy Rating: Adequately defined (A)	**Performance Rating:** Performing effectively (1)

4.3 Asset disposal

Key process: Asset disposal is the consideration of alternatives for the disposal of surplus, obsolete, under-performing or unserviceable assets

Expected outcome: The asset management framework minimises holdings of surplus and underperforming assets and lowers service costs. The cost-benefits of disposal options are evaluated

Overall Process and Policy/Performance rating: Adequately defined (A) / Performing effectively (1)

<table>
<tr><th>Effectiveness criteria</th><th colspan="2">Findings</th></tr>
<tr><td rowspan="2">3.1 Under-utilised and under-performing assets are identified as part of a regular systematic review process</td><td colspan="2">Through discussion with the Senior Powerhouse Mechanical Engineer and examination of relevant supporting documentation, we observed that during the review period, Alcoa continued to apply 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.</td></tr>
<tr><td>Process and Policy Rating: Adequately defined (A)</td><td>Performance Rating: Performing effectively (1)</td></tr>
</table>

<table>
<tr><th>Effectiveness criteria</th><th colspan="2">Findings</th></tr>
<tr><td rowspan="2">3.2 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 Senior Powerhouse Mechanical Engineer and examination of relevant supporting documentation, we observed that during the review period, Alcoa continued to apply the following mechanisms to facilitate the examination of under-utilised and under-performing assets:
Collection of relevant data and information to enable assessment of the root cause of any under-utilisation or poor performance of Powerhouse assets
Incorporation of those assessments 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, 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>Process and Policy Rating: Adequately defined (A)</td><td>Performance Rating: Performing effectively (1)</td></tr>
<tr><td rowspan="2">3.3 Disposal alternatives are evaluated</td><td colspan="2">Through discussion with the Senior Powerhouse Mechanical Engineer and examination of Alcoa’s Asset Management 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 Senior Powerhouse Mechanical Engineer 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 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>Process and Policy Rating: Adequately defined (A)</td><td>Performance Rating: Not rated</td></tr>
</table>

<table>
<tr><th>Effectiveness criteria</th><th colspan="2">Findings</th></tr>
<tr><td rowspan="2">3.4 There is a replacement strategy for assets.</td><td colspan="2">Through discussion with the Senior Powerhouse Mechanical Engineer and examination of the Asset Strategies for each of Alcoa’s powerhouses, we determined that:
Alcoa’s strategies do not envisage or promote complete asset replacement during the projected operating lifetime of the refinery
During the review period, Alcoa’s processes continued to provide for:
Asset replacement to occur only in those circumstances driven by the project management framework outlined in ‘2. Asset Creation and Acquisition’ above
Asset degradation to be monitored and controlled through:
Asset Management Strategies, which are designed to mitigate the risk of asset failure
Ongoing inspections and loss prevention analysis
Live monitoring of data through the Honeywell system
Residual life KPIs within the EMM portal.</td></tr>
<tr><td>Process and Policy Rating: Adequately defined (A)</td><td>Performance Rating: Performing effectively (1)</td></tr>
</table>

4.4 Environmental analysis

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

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

Overall Process and Policy/Performance rating: Requires some improvement (B) / Corrective action required (3)

Effectiveness criteria	Findings

4.1 Opportunities and threats in the asset management system environment are assessed	Through discussion with the Senior Powerhouse Mechanical Engineer and Senior Electrical Engineer, Powerhouse; 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
	  ○ WA 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 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

Effectiveness criteria	Findings	
4.1 (cont.)	• Risk Assessments performed in 2017 identified several deficiencies and improvement opportunities for each of the Kwinana, Pinjarra and Wagerup powerhouses. We observed that: ○ Registers to track these deficiencies and improvement opportunities had not been regularly updated throughout the review period: ○ Several items had been addressed throughout the period 2017 to June 2022 ○ Some items had either not been addressed or remained in progress. Through our review of the current risk assessments (2022) and observations during site visits to each powerhouse, we determined that not all improvement opportunities have been implemented, mainly due to budget constraints and lack of resources, especially through the COVID period. We also noted that although no non-compliances were recorded for the audit period, Kwinana Powerhouse Boilers 2 and 3 recorded high values of NOx and CO emissions, which are indicative of the aging assets. Since the Kwinana Powerhouse five-year plan still has dependency for boilers 2 and 3 to be functioning (i.e. no plans for retiring these assets any time in the near future), consideration could be given to increasing the frequency for inspection and overhaul campaign of these aging boilers. *These matters were discussed with Alcoa staff.*	
	Process and Policy Rating: Requires some improvement (B)	**Performance Rating:** Improvement required (2)

Effectiveness criteria	Findings

4.2 Performance standards (availability of service, capacity, continuity, emergency response, etc.) are measured and achieved	Through discussion with the WA Powerhouse Operations Head of Operations, Senior Powerhouse Mechanical Engineer and Senior Electrical Engineer, Powerhouse; and examination of supporting documentation, 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, boiler inspections, etc.

Effectiveness criteria	Findings	
4.2 (cont.)	We also observed that: • Each of Alcoa's Powerhouses had consistently not met target maintenance performance during the audit period. The Pinjarra Powerhouse achieved only half of the target for the 'Late Critical Compliance %' metric (which reports details of overdue work orders relating to critical assets), due to lack of resources and some miscommunication between the mobile maintainer and Alcoa's eAM system • Work relating to standardising procedures for Electrical Power Distribution assets for all three Powerhouses was underway and numerous work orders have been raised in relation to tracking completion of this work • Nevertheless, a backlog of works indicates an increasing trend towards failure in the work order management processes. **Recommendation 1/2022** *Alcoa:* *(c) Review the implications of the continued trend towards failure in its work order management processes* *(d) Determine any further appropriate corrective action.*	
	Process and Policy Rating: Requires some improvement (B)	**Performance Rating:** Corrective action required (3)

Effectiveness criteria	Findings	

4.3 Compliance with statutory and regulatory requirements	Through discussion with the Senior Powerhouse Mechanical Engineer and Senior Electrical Engineer, Powerhouse; 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
	  ○ 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 (not applicable for 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.
	• Noise management is a key focus area at Wagerup. Despite noise reductions achieved to date, it is not technically feasible for Wagerup to comply with the noise levels specified in Regulation 8 of the Environmental Protection (Noise) Regulations 1997 at all times. The only manner by which Alcoa can practicably reach full compliance is through a variation under Regulation 17 or through further acquisition of property; or a combination of the two. Noise levels measured during 2021 were generally similar to levels measured in previous years, hence variations were not considered to be of a significant nature for this audit period.	

	Process and Policy Rating: Adequately defined (A)	**Performance Rating:** Performing effectively (1)
4.4 Service standard (customer service levels etc) are measured and achieved	Through discussion with the Senior Powerhouse Mechanical Engineer and Senior Electrical Engineer, Powerhouse; 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 and steam 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 3.1 and 4.2 for further commentary on performance monitoring).	
	Process and Policy Rating: Adequately defined (A)	**Performance Rating:** Performing effectively (1)

4.5 Asset operations

Key process: Asset operations is the day-to-day running of assets (where the asset is used for its intended purpose)

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

Overall Process and Policy/Performance rating: Requires some improvement (B) / Corrective action required (3)

<table>
<tr><th>Effectiveness criteria</th><th colspan="2">Findings</th></tr>
<tr><td rowspan="2">5.1 Operational policies and procedures are documented and linked to service levels required</td><td colspan="2">Through discussion with the Senior Powerhouse Mechanical Engineer and Senior Electrical Engineer, Powerhouse; 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.</td></tr>
<tr><td>Process and Policy Rating: Adequately defined (A)</td><td>Performance Rating: Performing effectively (1)</td></tr>
<tr><td rowspan="2">5.2 Risk management is applied to prioritise operations tasks</td><td colspan="2">Through discussion with the Senior Powerhouse Mechanical Engineer and Senior Electrical Engineer, Powerhouse; 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.</td></tr>
<tr><td>Process and Policy Rating: Adequately defined (A)</td><td>Performance Rating: Performing effectively (1)</td></tr>
</table>

Effectiveness criteria	Findings	

5.3 Assets are documented in an asset register including asset type, location, material, plans of components, and an assessment of assets' physical/structural condition	Through discussion with the Senior Powerhouse Mechanical Engineer and Senior Electrical Engineer, Powerhouse; and examination of supporting documentation, we determined that Alcoa:
	• Manages powerhouse equipment through its eAM system, 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.	

	Process and Policy Rating: Adequately defined (A)	**Performance Rating:** Performing effectively (1)
5.4 Accounting data is documented for assets	We observed that Alcoa's asset register and corporate records capture appropriate accounting data, including: • Purchase date • Acquisition cost • Depreciation rates and costs • Written down values.	
	Process and Policy Rating: Adequately defined (A)	**Performance Rating:** Performing effectively (1)

5.5 Operational costs are measured and monitored	Through discussion with Senior Powerhouse Mechanical Engineer and Senior Electrical Engineer, Powerhouse; and examination of supporting documentation, 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.	

	Process and Policy Rating: Adequately defined (A)	**Performance Rating:** Performing effectively (1)

Effectiveness criteria	Findings	

5.6 Staff resources are adequate and staff receive training commensurate with their responsibilities	Through discussion with Senior Powerhouse Mechanical Engineer and Senior Electrical Engineer, Powerhouse; and examination of supporting documentation, we determined that:
	• Alcoa Powerhouse maintains up-to-date organisation charts for each site
	• 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
	• However, the following factors indicate staffing levels have not been sufficient for maintaining control of the maintenance works management processes:
	  ○ An increasing backlog of maintenance tasks and overdue work orders for each Powerhouse, particularly critical tasks at Pinjarra
	  ○ Recent turnover in key leadership staff at the Pinjarra and Wagerup sites
	  ○ Some improvement opportunities identified in 2017 risk registers remain open.
	Recommendation 2/2022
	Alcoa establish an action plan to debottleneck the current backlog of work orders and to regain full control of its asset management and maintenance works processes.	

	Process and Policy Rating: Requires some improvement (B)	**Performance Rating:** Corrective action required (3)

4.6 Asset maintenance

Key process: Asset maintenance is the upkeep of assets

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

Overall Process and Policy/Performance rating: Requires some improvement (B) / Corrective action required (3)

<table>
<tr><th>Effectiveness criteria</th><th colspan="2">Findings</th></tr>
<tr><td rowspan="2">6.1 Maintenance policies and procedures are documented and linked to service levels required</td><td colspan="2">Through discussion with Senior Powerhouse Mechanical Engineer and Senior Electrical Engineer, Powerhouse; and examination of 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.</td></tr>
<tr><td>Process and Policy Rating: Adequately defined (A)</td><td>Performance Rating: Performing effectively (1)</td></tr>
<tr><td rowspan="2">6.2 Regular inspections are undertaken of asset performance and condition</td><td colspan="2">Through discussion with Senior Powerhouse Mechanical Engineer and Senior Electrical Engineer, Powerhouse; and examination of 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.</td></tr>
<tr><td>Process and Policy Rating: Adequately defined (A)</td><td>Performance Rating: Performing effectively (1)</td></tr>
</table>

Effectiveness criteria	Findings	
6.3 Maintenance plans (emergency, corrective and preventative) are documented and completed on schedule	Through discussion with Senior Powerhouse Mechanical Engineer and Senior Electrical Engineer, Powerhouse; and examination of supporting documentation, we determined that Alcoa: • Maintained the following practices to support its documentation and completion of maintenance plans: ○ 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 ○ 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 ○ Maintenance schedules are monitored. We sighted examples of EMMs maintenance work order activity reports, which contains data on completion rates and overdue work orders categorised by priority ○ Alcoa's EMMs portal also provides a strong capability for monitoring performance metrics such as the 'Late Critical Compliance %' metric. The main purpose of these metrics was to leverage Alcoa's data and reporting capabilities to drive further maintenance efficiencies, which demonstrates a focus on continuous improvement in its approach to maintenance ○ Maintenance strategies are reviewed annually or when there are significant events that affect the assets. • Alcoa experienced the following challenges in completing its maintenance plans on schedule: ○ The 2017 AMS review assessed that although Alcoa's work order planning and monitoring processes are driven by experienced staff/managers who are responsible for maintaining powerhouse reliability, those processes could be further improved with more structured guidance on the relevant priority of maintenance tasks. In response, Alcoa reviewed the potential benefit of implementing additional structure to its maintenance prioritisation, concluding that it is satisfied with the current arrangements as they most effectively align with Alcoa Global standards for categorising powerhouse assets as critical assets, which result in those maintenance tasks also being categorised as critical ○ In light of the increasing backlog of maintenance works at all three sites (especially at Pinjarra), there is an increasing need for more concentrated effort in the allocation of resources, including the use of contractors and specialist companies that can assist in diagnosing maintenance works for aging assets. As this issue is essentially a symptom of the issues raised at 4.2 (relating to performance standards) and 5.6 (relating to staff resources) of this report, the recommended action to address those issues should see improvements to Alcoa's completion of scheduled maintenance plans. **Recommendation - refer to Recommendations 1/2022 and 2/2022**	
	Process and Policy Rating: Requires some improvement (B)	**Performance Rating:** Corrective action required (3)

Effectiveness criteria	Findings	
6.4 Failures are analysed and operational/maintenance plans adjusted where necessary	Through discussion with Senior Powerhouse Mechanical Engineer and Senior Electrical Engineer, Powerhouse; 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. We sighted a full list of unplanned outages and asset reliability issues occurring at each site during the review period, plus a sample of supporting evidence relating to unplanned outages, power distribution disturbances, boiler reliability issues and turbine reliability issues.	
	Process and Policy Rating: Adequately defined (A)	**Performance Rating:** Performing effectively (1)

Effectiveness criteria	Findings	

6.5 Risk management is applied to prioritise maintenance tasks	Through discussion with Senior Powerhouse Mechanical Engineer and Senior Electrical Engineer, Powerhouse; and examination of supporting documentation, we determined that Alcoa applied the following risk management practices to support in its prioritisation of maintenance tasks:
	• 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 scheduled outages
	• However, most of the improvement opportunities identified in Alcoa's 2017 Risk Assessment Registers for each sites remain open, with no action noted over 5 years to implement or address these items.
	As detailed at 4.2 above, we also observed the following circumstances which have challenged Alcoa's ability to continue to effectively prioritise its maintenance tasks commensurate with related risks:
	• Each of Alcoa's Powerhouses had consistently not met target maintenance performance during the audit period. The Pinjarra Powerhouse achieved only half of the target for the 'Late Critical Compliance %' metric, due to lack of resources and some miscommunication between the mobile maintainer and Alcoa's eAM system
	• Work relating to standardising procedures for Electrical Power Distribution assets for all three Powerhouses was underway and numerous work orders have been raised in relation to tracking completion of this work
	• Nevertheless, a backlog of works indicates an increasing trend towards failure in the work order management processes.
	Recommendation - refer to Recommendation 1/2022	

	Process and Policy Rating: Requires some improvement (B)	**Performance Rating:** Corrective action required (3)

Effectiveness criteria	Findings	

6.6 Maintenance costs are measured and monitored	Through discussion with Senior Powerhouse Mechanical Engineer and Senior Electrical Engineer, Powerhouse; 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.	

	Process and Policy Rating: Adequately defined (A)	**Performance Rating:** Performing effectively (1)

4.7 Asset management information systems

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

Expected outcome: The asset management information system provides authorised, complete and accurate information for the day-to-day 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 Process and Policy/Performance rating: Adequately defined (A) / Performing effectively (1)

<table>
<tr><th>Effectiveness criteria</th><th colspan="2">Findings</th></tr>
<tr><td rowspan="2">7.1 Adequate system documentation for users and IT operators</td><td colspan="2">Through discussion with the Senior Powerhouse Mechanical Engineer and consideration of Alcoa’s IT security documentation, we observed that:
Alcoa’s WA Powerhouse operations are supported by Alcoa’s Global Support Centre (GSC)for the Oracle e-business suite, which houses the range of applications used by Alcoa’s operations, including the eAM system
The GSC’s technical support for the eAM system, includes management and maintenance of technical eAM system documentation
The Alcoa Performance Support System 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.
Alcoa maintains an appropriate suite of system documentation for its key control systems, network and infrastructure.</td></tr>
<tr><td>Process and Policy Rating: Adequately defined (A)</td><td>Performance Rating: Performing effectively (1)</td></tr>
<tr><td rowspan="2">7.2 Input controls include suitable verification and validation of data entered into the system</td><td colspan="2">Through discussion with the Senior Powerhouse Mechanical Engineer and walkthrough of a sample of functions managed by the eAM maintenance management system, we observed that appropriate data verification and validation controls and techniques are embedded within the system.</td></tr>
<tr><td>Process and Policy Rating: Adequately defined (A)</td><td>Performance Rating: Performing effectively (1)</td></tr>
</table>

Effectiveness criteria	Findings	
7.3 Security access controls appear adequate, such as passwords	Through discussion with the Senior Powerhouse Mechanical Engineer and consideration of Alcoa's IT security and account management policies and procedures, we observed that: • Alcoa has established and maintained procedures and controls which enable all key system access and permissions (including remote access) to be managed in accordance with Alcoa of Australia's Security Access Policy, which 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 systems, where all users are assigned a unique user account and password • Account password requirements have continued to be further enhanced during the review period • Alcoa utilises a contemporary password management tool to synchronise passwords for the overall Oracle suite within the Windows environment.	
	Process and Policy Rating: Adequately defined (A)	**Performance Rating:** Performing effectively (1)
7.4 Physical security access controls appear adequate	Through discussion with the Senior Powerhouse Mechanical Engineer, consideration of relevant supporting documentation and site inspection, we observed that Alcoa has established and maintained appropriate processes and procedures relating to the access of facilities and the physical protection of information assets and systems. Specifically in the context of access to computer server rooms and other control systems on site, we observed that: • Access to site operations buildings, main control room and key plant control facilities is via access cards • Physical access to Alcoa's data centre in Perth is via access cards, with the Data Centre Manager monitoring and managing access • Alcoa has maintained precautions to contain fire and other damaging events in its Data Centre.	
	Process and Policy Rating: Adequately defined (A)	**Performance Rating:** Performing effectively (1)
7.5 Data backup procedures appear adequate and backups are tested	Through discussion with the Senior Powerhouse Mechanical Engineer and consideration of Alcoa's data security and policies and procedures, we observed that Alcoa's procedures provide for regular backups of all key data in accordance with accepted industry practice, including: • Daily backup of production data and EBS data, which includes eAM system data • Regular testing of back-ups and system recovery processes • Archiving and off-site storage, which is managed by Recall • Provision for system recovery exercises to be conducted as part of disaster recovery plan testing.	
	Process and Policy Rating: Adequately defined (A)	**Performance Rating:** Performing effectively (1)

Effectiveness criteria	Findings	
7.6 Computations for licensee performance reporting are 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	
	Process and Policy Rating: Not rated	**Performance Rating:** Not rated
7.7 Management reports appear adequate for the licensee to monitor licence obligations	Through discussion with the Senior Powerhouse Mechanical Engineer and consideration of relevant supporting documentation and management reporting procedures, we determined that: • Alcoa's eAM system is capable of generating a substantial variety of reports • Management reports relating to the operation and performance of each powerhouse are produced on a scheduled basis and can also be produced on request. • Alcoa performs an annual high-level review to assess compliance with all licence obligations to determine whether it has complied with the provisions of its Licence and can report results to the ERA by 31 August each year.	
	Process and Policy Rating: Adequately defined (A)	**Performance Rating:** Performing effectively (1)
7.8 Adequate measures to protect asset management data from unauthorised access or theft by persons outside the organisation	Through discussion with the Senior Powerhouse Mechanical Engineer and examination of relevant IT data security procedures, we determined that with the full support of its Global Support Centre, Alcoa has established and maintained appropriate processes and procedures relating to the protection of information assets and systems, including: • Comprehensive user access controls, including user permissions and remote access • Contemporary cyber security processes and procedures.	
	Process and Policy 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: The risk management framework effectively manages the risk that the licensee does not maintain effective service standards

Overall Process and Policy/Performance rating: Adequately defined (A) / Performing effectively (1)

Effectiveness criteria	Findings	
8.1 Risk management policies and procedures exist and are applied to minimise internal and external risks	Through discussion with the Senior Powerhouse Mechanical Engineer and examination of Alcoa's risk management practices, we determined that: • Through 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 / ISO 31000. 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 As noted by previous AMS reviews (refer to Recommendation 3/2013), Alcoa's suite of risk management policies and procedures have not yet been updated to reference the most recent Risk Management Australian standard, ISO31000:2018. Although not fundamentally different to previous standards, the current standard provides a the most current guidance on how risk management should be implemented and integrated into an organisation. We acknowledge that Alcoa had initiated a review of its overarching risk management procedures in 2021, however the results of that review have not yet been finalised and reflected in local policy and procedures. This matter remains a relatively minor matter to be closed-out • 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). We observed evidence of risk management activities being applied to WAO Powerhouse planning and management activities throughout the review period.	
	Process and Policy Rating: Requires some improvement (B)	**Performance Rating:** Performing effectively (1)

<table>
<tr><th>Effectiveness criteria</th><th colspan="2">Findings</th></tr>
<tr><td rowspan="2">8.2 Risks are documented in a risk register and treatment plans are implemented and monitored</td><td colspan="2">Through discussion with the Senior Powerhouse Mechanical Engineer and examination of Alcoa’s risk management practices and risk registers, we determined that:
Alcoa’s risk management methodology outlines the process for assessing risks identified in Alcoa’s operating environment and for developing mitigation strategies
The primary method for capturing powerhouse related risks is through 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
Recommended actions are assigned to a responsible person with the status of actions reviewed and updated regularly
Environmental, health and safety risks are specifically captured in EHS risk registers for each Powerhouse, with associated improvements plans and opportunities subject to regular monitoring and update.</td></tr>
<tr><td>Process and Policy Rating: Adequately defined (A)</td><td>Performance Rating: Performing effectively (1)</td></tr>
</table>

Effectiveness criteria	Findings	
8.3 Probability and consequences of asset failure are regularly assessed	Through discussion with the Senior Powerhouse Mechanical Engineer, examination of Alcoa's Asset Management Strategies and consideration of Alcoa's asset planning and risk management practices, we determined that Alcoa has applied the following mechanisms for identifying and assessing the consequence and likelihood of powerhouse asset failure: • Alcoa's approach to risk management and asset failure is reflected in its Asset Management Strategies and task-based risk assessments (e.g. for project works or maintenance activities) • An Equipment Integrity 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, which is reported to relevant Alcoa of Australia and Alcoa Global personnel in the quarterly AWA Global Refining Power report • Loss prevention inspections are performed to identify mechanical and electrical equipment breakdown exposures that could result in a major loss • During scheduled outages, 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 Management 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. We sighted a full list of unplanned outages and asset reliability issues occurring at each site during the review period, plus a sample of supporting evidence relating to unplanned outages, power distribution disturbances, boiler reliability issues and turbine reliability issues.	
	Process and Policy 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 major disruptions to service standards

Overall Process and Policy/Performance rating: Adequately defined (A) / Performing effectively (1)

Effectiveness criteria	Findings	

9.1 Contingency plans are documented, understood and tested to confirm their operability and to cover higher risks	Through discussion with the Senior Powerhouse Mechanical Engineer and examination of relevant supporting documentation, we determined that Alcoa has maintained a business continuity management framework comprising a series of system recovery plans that are subject to testing in accordance with specified timeframes. Specifically, we determined 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 comprehensive system recovery plans, including black/brown start procedures as well as a resourced roster to enable the continuation of operations:
	  ○ In the event of an incident, 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
	  ○ Brown start procedures enable recovery from a partial shutdown
	• All relevant WA Powerhouse staff are required 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 WA 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 plans and procedures, broadly for its whole of site-operations and more specifically for its powerhouse operations, including evacuation procedures and training requirements, weekly testing of alarms and mock exercises/drills. We observed evidence of mock emergency response activities performed during the review period
	• In 2020, Alcoa reviewed its Emergency Response plans and procedures to ensure they remained current and address Alcoa's method and frequency of test procedures.	

	Process and Policy Rating: Adequately defined (A)	**Performance Rating:** Performing effectively (1)

4.10 Financial planning

Key process: Financial brings together the financial elements of the service delivery to ensure its financial viability over the long term

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

Overall Process and Policy/Performance rating: Adequately defined (A) / Performing effectively (1)

<table>
<tr><th>Effectiveness criteria</th><th colspan="2">Findings</th></tr>
<tr><td rowspan="2">10.1 The financial plan states the financial objectives and identifies strategies and actions to achieve those</td><td colspan="2">Through discussion with the WA Operations Powerhouse Manager and Senior Powerhouse Mechanical Engineer; 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
WA 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.</td></tr>
<tr><td>Process and Policy Rating: Adequately defined (A)</td><td>Performance Rating: Performing effectively (1)</td></tr>
<tr><td rowspan="2">10.2 The financial plan identifies the source of funds for capital expenditure and recurrent costs</td><td colspan="2">Through discussion with the Senior Powerhouse Mechanical Engineer and consideration of Alcoa’s financial planning mechanisms, we observed that the Alcoa WA Operations annual budget is aligned with Alcoa of Australia’s overall business plans and is expected to be fully funded through its operational revenue.</td></tr>
<tr><td>Process and Policy Rating: Adequately defined (A)</td><td>Performance Rating: Performing effectively (1)</td></tr>
<tr><td rowspan="2">10.3 The financial plan provides projections of operating statements (profit and loss) and statement of financial position (balance sheets)</td><td colspan="2">Through discussion with the Senior Powerhouse Mechanical Engineer and consideration of Alcoa’s financial planning mechanisms, we determined that:
Although projections of operating statements and statements 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
Expense control reports are used for reporting actual v budget costs at a powerhouse level
Projections of operating statements and statements of financial position are prepared at a detailed level for the next year, with higher level projections for a further two years also prepared.</td></tr>
<tr><td>Process and Policy Rating: Adequately defined (A)</td><td>Performance Rating: Performing effectively (1)</td></tr>
</table>

Effectiveness criteria	Findings	
10.4 The financial plan provides firm predictions on income for the next five years and reasonable predictions beyond this period	Through discussion with the Senior Powerhouse Mechanical Engineer and consideration of Alcoa's financial planning mechanisms, we observed that: • As Alcoa's WA Powerhouses primarily contribute to supporting refinery operations, the output of its powerhouses is not intended as a main income source • WA Operations develops three year financial plans at a high level and capital funding plans for periods of up to 10 years.	
	Process and Policy Rating: Adequately defined (A)	**Performance Rating:** Performing effectively (1)
10.5 The financial plan provides for the operations and maintenance, administration and capital expenditure requirements of the services	Through discussion with the Senior Powerhouse Mechanical Engineer 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.	
	Process and Policy Rating: Adequately defined (A)	**Performance Rating:** Performing effectively (1)
10.6 Large variances in actual/budget income and expenses are identified and corrective action taken where necessary	Through discussion with the Senior Powerhouse Mechanical Engineer and consideration of Alcoa's financial planning mechanisms, we observed that: • Actual v budgeted expenditure is monitored on a monthly basis through Expense Control Reports and supporting Operational and Maintenance Cost Reports, with variances identified and investigated where required to determine whether corrective action is required • The WA Operations 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. On a monthly basis, the remaining year's expenditure is reforecast to determine the full year position.	
	Process and Policy 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 for these works 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: The capital expenditure plan provides reliable forward estimates of capital expenditure and asset disposal income. Reasons for the decisions and for the evaluation of alternatives and options are documented

Overall Process and Policy/Performance rating: Adequately defined (A) / Performing effectively (1)

<table>
<tr><th>Effectiveness criteria</th><th colspan="2">Findings</th></tr>
<tr><td rowspan="2">11.1 There is a capital expenditure plan covering works to be undertaken, actions proposed, responsibilities and dates</td><td colspan="2">Through discussion with the WA Operations Powerhouse Manager and Senior Powerhouse Mechanical Engineer; 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
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
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.</td></tr>
<tr><td>Process and Policy Rating: Adequately defined (A)</td><td>Performance Rating: Performing effectively (1)</td></tr>
<tr><td rowspan="2">11.2 The capital expenditure plan provides reasons for capital expenditure and timing of expenditure</td><td colspan="2">Through discussion with the Senior Powerhouse Mechanical Engineer 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
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
Capital projects in excess of AUD$250K are required to seek approval using Alcoa’s Request for Authority process to justify the reasoning and timing of the expenditure.</td></tr>
<tr><td>Process and Policy Rating: Adequately defined (A)</td><td>Performance Rating: Performing effectively (1)</td></tr>
</table>

Effectiveness criteria	Findings	

11.3 The capital expenditure plan is consistent with the asset life and condition identified in the asset management plan	Through discussion with the Senior Powerhouse Mechanical Engineer 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
	  ○ 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.	

	Process and Policy Rating: Adequately defined (A)	**Performance Rating:** Performing effectively (1)
11.4 There is an adequate process to ensure the capital expenditure plan is regularly updated and implemented	Through discussion with the Senior Powerhouse Mechanical Engineer 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 WA Operations 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, projects are reviewed against the approved criteria to assess whether project objectives were realised.	
	Process and Policy 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: The asset management system is regularly reviewed and updated

Overall Process and Policy/Performance rating: Adequately defined (A) / Performing effectively (1)

<table>
<tr><th>Effectiveness criteria</th><th colspan="2">Findings</th></tr>
<tr><td>12.1 A review process is in place to ensure the asset management plan and the asset management system described in it remain current</td><td colspan="2" rowspan="2">Through discussion with the WA Operations Powerhouse Manager, Senior Powerhouse Mechanical Engineer and Senior Electrical Engineer, Powerhouse; and examination of the Pinjarra, Wagerup and Kwinana Powerhouse Asset Strategies and supporting Asset Management Strategies, we determined that Alcoa has put mechanisms in place for the regular review of the asset management system. In particular, we observed that:
Asset Management Strategies are reviewed at regular intervals and in the event of a major equipment failure
Alcoa performs an annual high-level review to assess compliance with all licence obligations to determine whether it 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 Alcoa Self-Assessment Test (ASAT) audits to be conducted by Alcoa’s Internal Audit team, which is independent of Alcoa’s asset management system, with a focus on asset operations, maintenance, health and safety and environment. In 2018, Alcoa’s rescheduled its ASAT audits to be at four year intervals
In early 2022, Alcoa commissioned Wood Group to perform an independent review of its WA Powerhouse operations. The results of that review were presented in July 2022. The scope of the review included Alcoa Powerhouse’s:
Asset management program, including strategic asset management processes
Organisational structure
Processes for recognising, analysing and managing operational risk, plant configuration and equipment alignment, and the interface with broader refinery risks.</td></tr>
<tr><td>12.2 Independent reviews (e.g. internal audit) are performed of the asset management system</td></tr>
<tr><td></td><td>Process and Policy Rating: Adequately defined (A)</td><td>Performance Rating: Performing effectively (1)</td></tr>
</table>

5. Status of recommendations addressing asset system deficiencies from the previous review

Reference (no./year)	**Process and policy deficiency / Performance deficiency** (Rating / Reference number, Asset management process & effectiveness criterion / Details of deficiency)	Reviewer's recommendation or action planned	Date resolved	**Further action required** (Yes/No/Not Applicable) **Details of further action required** (including current recommendation reference, if applicable)
A. Resolved during current review period				
1/2017	**B2** ***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.	**Action Plan** 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.	(a) June 2018 (b) December 2019	No

Reference (no./year)	**Process and policy deficiency / Performance deficiency** (Rating / Reference number, Asset management process & effectiveness criterion / Details of deficiency)	Reviewer's recommendation or action planned	Date resolved	**Further action required** (Yes/No/Not Applicable) **Details of further action required** (including current recommendation reference, if applicable)
2/2017	**B2** ***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).	**Action Plan** Alcoa will formally assess and, where necessary, amend the timeframe for reviewing its Powerhouse Asset Strategies.	June 2018	No
3/2017	**B2** ***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.	**Action Plan** 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	December 2020	No

Reference (no./year)	**Process and policy deficiency / Performance deficiency** (Rating / Reference number, Asset management process & effectiveness criterion / Details of deficiency)	Reviewer's recommendation or action planned	Date resolved	**Further action required** (Yes/No/Not Applicable) **Details of further action required** (including current recommendation reference, if applicable)
	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.	assigned as critical (i.e. to re-assign with a lower priority).		
4/2017	**B2** ***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 (ERPs) 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.	**Action Plan** Alcoa will update its ERPs to provide for: • Frequency of testing • Method of testing • Required documentation/ reporting outputs • A lessons learned mechanism.	December 2020	No

Reference (no./year)	**Process and policy deficiency / Performance deficiency** (Rating / Reference number, Asset management process & effectiveness criterion / Details of deficiency)	Reviewer's recommendation or action planned	Date resolved	**Further action required** (Yes/No/Not Applicable) **Details of further action required** (including current recommendation reference, if applicable)
5/2017	**B2** ***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.	**Action Plan** 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.	December 2018	No

Reference (no./year)	**Process and policy deficiency / Performance deficiency** (Rating / Reference number, Asset management process & effectiveness criterion / Details of deficiency)	Reviewer's recommendation or action planned	**Further action required** (Yes/No/Not Applicable) **Details of further action required** (including current recommendation reference, if applicable)
B. Unresolved at end of current review period			
3/2013	**B2** ***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.* <u>2013 AMS review report finding</u> 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. <u>Current status</u> 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.	**Action Plan** Alcoa will update the Risk Management suite of documents to reflect the revised Risk Management standard AS/NZS ISO 31000:2009	Yes. We acknowledge that Alcoa had initiated a review of its overarching risk management procedures in 2021, however the results of that review have not yet been finalised and reflected in local policy and procedures. This matter remains a minor matter to be closed out.

Appendix A – Review Plan

ASSURANCE ADVISORY GROUP

Alcoa of Australia Limited

Electricity Generation Licence (EGL14)

2022 Asset Management Review

Review Plan

July 2022

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Introduction

Overview

The Economic Regulation Authority (the **ERA**) has under the provisions of the Electricity Industry Act 2004 (the **Act**), issued to Alcoa of Australia Limited (**Alcoa**) an Electricity Generation Licence (EGL 14) (the **Licence**).

Section 14 of the Act requires Alcoa to provide to the ERA an asset management system review (the **review**) report conducted by an independent expert acceptable to the ERA not less than once in every 24-month period unless otherwise approved by the ERA. With the ERA's approval, Assurance Advisory Group (**AAG**) has been appointed to conduct the review for the period 1 July 2017 to 30 June 2022 (**review period**).

The Licence relates to Alcoa's operation of electricity generation works at its Kwinana, Pinjarra and Wagerup facilities. These works are managed by Alcoa's WA powerhouse operations within the WA Operations 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 will be conducted in accordance with the ERA's March 2019 issue of the *Audit and Review Guidelines: Electricity and Gas Licences* (**Review Guidelines**). In accordance with the Review Guidelines this document represents the Review Plan (the **Plan**) that is to be agreed upon by AAG and Alcoa and presented to the ERA for approval.

Objective

The objective of the review is to independently examine the effectiveness and performance of the asset management system established for the assets subject to Alcoa's Licence during the review period.

Scope

In accordance with the Review Guidelines, the review will consider the effectiveness of Alcoa's existing control procedures within the 12 key processes in the asset management life cycle as outlined below at Table 1. Each key process and effectiveness criteria is applicable to Alcoa's Licence and as such will be individually considered in this review.

Table 1 – Asset management system key processes and effectiveness criteria

Key processes	Effectiveness criteria
1. Asset Planning	1.1 Asset management plan covers the processes in this table 1.2 Planning processes and objectives reflect the needs of all stakeholders and is integrated with business planning 1.3 Service levels are defined in the asset management plan 1.4 Non-asset operations (e.g. demand management) are considered 1.5 Lifecycle costs of owning and operating assets are assessed 1.6 Funding options are evaluated 1.7 Costs are justified, and cost drivers identified 1.8 Likelihood and consequences of asset failure are predicted 1.9 Asset management plan is regularly reviewed and updated.

Key processes	Effectiveness criteria
2. Asset creation and acquisition	2.1 Full project evaluations are undertaken for new assets, including comparative assessment of non-asset options 2.2 Evaluations include all life-cycle costs 2.3 Projects reflect sound engineering and business decisions 2.4 Commissioning tests are documented and completed 2.5 Ongoing legal / environmental / safety obligations of the asset owner are assigned and understood
3. Asset disposal	3.1 Under-utilised and under-performing assets are identified as part of a regular systematic review process 3.2 The reasons for under-utilisation or poor performance are critically examined and corrective action or disposal undertaken 3.3 Disposal alternatives are evaluated 3.4 There is a replacement strategy for assets
4. Environmental analysis	4.1 Opportunities and threats in the asset management system environment are assessed 4.2 Performance standards (availability of service, capacity, continuity, emergency response, etc.) are measured and achieved 4.3 Compliance with statutory and regulatory requirements 4.4 Service standard (customer service levels etc) are measured and achieved.
5. Asset operations	5.1 Operational policies and procedures are documented and linked to service levels required 5.2 Risk management is applied to prioritise operations tasks 5.3 Assets are documented in an asset register including asset type, location, material, plans of components, and an assessment of assets' physical/structural condition 5.4 Accounting data is documented for assets [new criteria] 5.5 Operational costs are measured and monitored 5.6 Staff resources are adequate and staff receive training commensurate with their responsibilities
6. Asset maintenance	6.1 Maintenance policies and procedures are documented and linked to service levels required 6.2 Regular inspections are undertaken of asset performance and condition 6.3 Maintenance plans (emergency, corrective and preventative) are documented and completed on schedule 6.4 Failures are analysed and operational/maintenance plans adjusted where necessary 6.5 Risk management is applied to prioritise maintenance tasks 6.6 Maintenance costs are measured and monitored
7. Asset management information systems	7.1 Adequate system documentation for users and IT operators 7.2 Input controls include suitable verification and validation of data entered into the system 7.3 Security access controls appear adequate, such as passwords 7.4 Physical security access controls appear adequate 7.5 Data backup procedures appear adequate and backups are tested 7.6 Computations for licensee performance reporting are accurate 7.7 Management reports appear adequate for the licensee to monitor licence obligations 7.8 Adequate measures to protect asset management data from unauthorised access or theft by persons outside the organisation [new criteria]

Key processes	Effectiveness criteria
8. Risk management	8.1 Risk management policies and procedures exist and are applied to minimise internal and external risks 8.2 Risks are documented in a risk register and treatment plans are implemented and monitored 8.3 Probability and consequences of asset failure are regularly assessed
9. Contingency planning	9.1 Contingency plans are documented, understood and tested to confirm their operability and to cover higher risks
10. Financial planning	10.1 The financial plan states the financial objectives and identifies strategies and actions to achieve those 10.2 The financial plan identifies the source of funds for capital expenditure and recurrent costs 10.3 The financial plan provides projections of operating statements (profit and loss) and statement of financial position (balance sheets) 10.4 The financial plan provides firm predictions on income for the next five years and reasonable predictions beyond this period 10.5 The financial plan provides for the operations and maintenance, administration and capital expenditure requirements of the services 10.6 Large variances in actual/budget income and expenses are identified and corrective action taken where necessary
11. Capital expenditure planning	11.1 There is a capital expenditure plan covering works to be undertaken, actions proposed, responsibilities and dates 11.2 The capital expenditure plan provides reasons for capital expenditure and timing of expenditure 11.3 The capital expenditure plan is consistent with the asset life and condition identified in the asset management plan 11.4 There is an adequate process to ensure the capital expenditure plan is regularly updated and implemented
12. Review of asset management system	12.1 A review process is in place to ensure the asset management plan and the asset management system described in it remain current 12.2 Independent reviews (e.g. internal audit) are performed of the asset management system

Alcoa's responsibility for maintaining an effective asset management system

Alcoa is responsible for putting in place policies, procedures and controls, which are designed to provide for an effective asset management system for assets subject to the Licence.

AAG's responsibility

Our responsibility is to express a limited assurance conclusion on whether, based on the procedures performed and the evidence obtained, anything has come to our attention that causes us to believe that Alcoa's AMS for assets subject to its Licence have not been established and maintained, in all material respects, in accordance with the Licence as measured by the effectiveness criteria in the Guidelines for the period from 1 July 2017 to 30 June 2022. The review will be conducted in accordance with Australian Standard on Assurance Engagements ASAE 3500 Performance Engagements (**ASAE 3500**), issued by the Australian Auditing and Assurance Standards Board.

ASAE 3500 requires that we plan and perform the review to obtain assurance about whether the AMS for assets subject to the Licence is materially ineffective. A limited assurance engagement conducted in accordance with ASAE 3500 involves identifying areas where the AMS for assets subject to a Licence is likely to be materially ineffective, addressing the areas identified and considering the process used to prepare the AMS for assets subject to the Licence. A limited assurance engagement is substantially less in scope than a reasonable assurance engagement in relation to both the risk assessment procedures,

including an understanding of internal control, and the procedures performed in response to the assessed risks.

Limitations of use

Our report will be produced 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 our report.

We understand that a copy of our report will be provided to the ERA for the purpose of meeting Alcoa's reporting requirements of section 14 of the Act. We agree that a copy of our report may be provided to the ERA for its information in connection with this purpose, however we accept no responsibility to the ERA or to anyone who is provided with or obtains a copy of our reports.

This plan is intended solely for the use of Alcoa for the purpose of its reporting requirements under section 14 of the Act.

Inherent limitations

A review consists primarily of making enquiries, primarily of persons responsible for the management of assets, applying analytical and other review procedures, and examination of evidence for a small number of transactions or events. A review is substantially less in scope than a reasonable assurance "audit" conducted in accordance with ASAEs. Accordingly, we will not express an audit opinion in the asset management system review report.

An assurance engagement relating to the period from 1 July 2017 to 30 June 2022 will not provide assurance on whether the AMS for assets subject to the Licence will remain effective in the future.

Independence

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

Approach

The review will be conducted in three distinct phases, being a risk assessment, system analysis/policy and procedure review and examination of performance. From the review results, a report will be produced to outline findings, overall assessments and recommendations for improvement in line with the Review Guidelines. Each step of the review is discussed in detail below.

Risk assessment

The review will focus on identifying or assessing those activities and management control systems to be examined and the matters subject to review. Therefore, the purpose of conducting the risk assessment as a preliminary phase enables the reviewer to focus on pertinent/high risk areas of Alcoa's asset management systems established for the assets subject to Alcoa's licence. The risk assessment considers changes to Alcoa's relevant systems and processes and any matters of significance raised by the ERA and/or Alcoa. The level of risk and materiality of the process determine the level of review required i.e., the greater the materiality and the higher the risk, the more effort will be applied.

The first step of the risk assessment is the rating of the potential consequences of Alcoa not effectively maintaining an asset management system for the assets subject to its licence, in the absence of mitigating controls. The consequence classification descriptions listed at Table 1 of the Reporting Manual, provides the risk assessment with context to enable the appropriate consequence rating to be applied to each component of the asset management system subject to review.

Once the consequence has been determined, the likelihood of Alcoa not effectively maintaining an asset management system for the assets subject to its licence (with reference to the defined effectiveness criteria) is assessed using the likelihood rating listed at Table 17 of the Review Guidelines (refer to Appendix 1). The assessment of likelihood is based on the expected frequency of non-performance against the defined criteria, over a period of time.

Table 2 below (sourced from the Review Guidelines) outlines the combination of consequence and likelihood ratings to determine the level of inherent risk associated with each individual effectiveness criteria

Table 2: Inherent risk rating

	Consequence		
Likelihood	Minor	Moderate	Major
Likely	Medium	High	High
Probable	Low	Medium	High
Unlikely	Low	Medium	High

Once the level of inherent risk has been determined, the adequacy of existing controls is assessed in order to determine the level of control risk. Controls are assessed and prioritised as weak, moderate or strong dependant on their suitability to mitigate the risks identified. The control adequacy ratings used by this risk assessment are aligned to the ratings specified in the Review Guidelines (refer to Appendix 1-3). Once inherent risks and control risks are established, the audit priority can then be determined using the matrix specified in the Review Guidelines (refer to Table 3 below). Essentially, the higher the level of risk the more substantive testing is required.

Table 3: Assessment of Review Priority

	Preliminary adequacy of existing controls		
Inherent Risk	Weak	Moderate	Strong
High	Review priority 1	Review Priority 2	
Medium	Review priority 3	Review Priority 4	
Low	Review Priority 5		

The following table outlines the review requirement for each level of review priority. Testing can range from extensive substantive testing around the controls and activities of particular processes (including physical inspection of asset infrastructure, which will be given greater attention for those processes with a review priority of 1, 2 or 3) to confirming the existence of controls through discussions with relevant staff.

Table 4: Review Priority Table

Priority rating	Review requirement
Review Priority 1	• Via interview and walkthrough, understand relevant processes and controls as they apply to each asset management system effectiveness criteria • Examine relevant documents, registers and reports as they apply to each asset management system effectiveness criteria • Obtain evidence of policies, procedures and controls being in place and working effectively • Controls testing and extensive substantive testing of activities and/or transactions as they apply to each asset management system effectiveness criteria, including physical inspection of applicable asset infrastructure • Follow-up and if necessary, re-test matters previously reported.
Review Priority 2	• Via interview and walkthrough, understand relevant processes and controls as they apply to each asset management system effectiveness criteria • Examine relevant documents, registers and reports as they apply to each asset management system effectiveness criteria • Obtain evidence of policies, procedures and controls being in place and working effectively • Controls testing and moderate substantive testing of activities and/or transactions as they apply to each asset management system effectiveness criteria, including physical inspection of applicable asset infrastructure • Follow-up and if necessary, re-test matters previously reported.
Review Priority 3	• Via interview and walkthrough, understand relevant processes and controls as they apply to each asset management system effectiveness criteria • Examine relevant documents, registers and reports as they apply to each asset management system effectiveness criteria • Limited controls testing (moderate sample size) of activities and/or transactions as they apply to each asset management system effectiveness criteria, including physical inspection of applicable asset infrastructure. Only substantively test transactions if further control weakness found • Follow-up of matters previously reported.
Review Priority 4	• Confirmation of existing controls via walk through of key processes and examination of key documents including policies and procedures, compliance/breach registers and reports • Follow-up of matters previously reported.
Review Priority 5	• Confirmation of existing controls via observation, discussions with key staff and/or reliance on key references including policies and procedures, compliance/breach registers and reports ("desktop review").

The risk assessment has been discussed with Alcoa representatives to gain their input as to the appropriateness and factual accuracy of risk and control ratings and associated explanations. The key sources considered in reaching our preliminary assessment of the risk and control ratings were based on:

- Our understanding of Alcoa's assets and internal processes
- Any other factors that may influence the level or strength of controls
- Consideration of relevant circumstances and activity that trigger specific performance issues.

At this stage, the risk assessment can only be a preliminary assessment based on reading of documentation and interviews by the auditors. It is possible that the ratings and risk assessment comments may be revised as we conduct our work and new evidence comes to light. The risk assessment is attached at Appendix 2.

System analysis / policy and procedure review

The level of policy and procedure review required will be determined utilising the priority scale. Once the priority level has been defined, the review will consist of:

- Interviewing Alcoa representatives and key operational and administrative staff responsible for the development and maintenance of policies and procedural type documentation
- Consideration of Alcoa's response to the recommendations made by the 2017 review
- Examination of documented policies and procedures for key functional requirements and consideration of their relevance to Alcoa's asset management system requirements and standards.

The policy and procedure element of the asset management system review will be performed to provide a rating as defined under Table 5 (refer below).

Key documents which may be subject to review are not specifically disclosed in this plan. A list of documents examined will be included in the review report.

Examination of performance

The actual performance of the relevant controls and processes in place will then be examined via:

- Consideration of reports and references evidencing activity
- Interviews with Alcoa representatives and key operational and administrative staff
- Consideration of Alcoa's response to the recommendations made by the 2017 review
- Physical visit to the Pinjarra, Wagerup and Kwinana facilities
- Consideration of each facility's function, normal modes of operation and age.

A full work program will be completed to record the specific aspects of our review and examination of the performance of each asset management system key process. This work program will be based on:

- The review priority determined by the risk assessment to be applicable to each effectiveness criteria
- The results of the policy and procedure review, as described above
- The location of personnel and activity to be tested.

Review fieldwork will include a visit to Alcoa's Kwinana, Wagerup and Pinjarra facilities, plus meetings with staff at Alcoa's Booragoon office.

The performance effectiveness element of the asset management system review will be performed to provide a rating as defined under Table 6 (refer below).

Reporting

The review report will also be structured to address all of the minimum contents specified in section 5 of the Review Guidelines.

In accordance with the Review Guidelines, the reviewer must provide an assessment of both the process and policy rating (refer to Table 5 below and Table 8 of the Guidelines) and the performance rating (refer to Table 6 below and Table 9 of the Guidelines) for each of the key processes in Alcoa's asset management system.

Alcoa is responsible for providing a separate post review implementation plan, if required.

Table 5: Process and policy rating scale

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 being managed
B	Requires some improvement	• Processes and policies require 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) requires minor improvements (taking into consideration the assets being managed)
C	Requires substantial improvement	• Processes and policies are incomplete or require substantial improvement • Processes and policies do not document the required performance of the assets • Processes and policies are considerably out of date • The asset management information system(s) requires substantial improvements (taking into consideration the assets 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 being managed).

Table 6: Performance rating scale

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	Improvement required	• The performance of the process requires some improvement to meet the required level • Process effectiveness reviews are not performed regularly enough • Recommended process improvements are not implemented
3	Corrective action required	• The performance of the process requires substantial improvement to meet the required level • Process effectiveness reviews are performed irregularly, or not at all • Recommended process improvements are not implemented
4	Serious action required	• Process is not performed, or the performance is so poor the process is considered to be ineffective.

Resources and team

Key Alcoa contacts

The key contacts for this review are:

- Senior Powerhouse Mechanical Engineer
- Senior Powerhouse Electrical Engineer
- WA Operations Powerhouse Manager
- Energy Director – Australia
- Energy Coordinator
- Management Accountant
- Environmental Scientist

AAG Staff

AAG staff who will be involved with this assignment are:

- Margaret-Mary Gauci Senior Consultant
- Tanuja Sanders Senior Engineer Consultant
- Andrew Baldwin Executive Director
- Stephen Linden Director (QA review).

Resumes for key AAG staff are outlined in the proposal accepted by Alcoa and subsequently presented to the ERA.

Timing

The initial risk assessment phase was completed on 12 July 2022, after which the draft review plan and risk assessment were presented to Alcoa for comment prior to submission to the ERA for review and approval.

The remainder of the fieldwork phase is scheduled to be performed over the period mid-July to early August 2022 enabling draft and final reports to be submitted to the ERA by the due dates of 31 August 2022 and 30 September 2022 respectively.

AAG time and staff commitment to the completion of the review is outlined in the proposal accepted by Alcoa. In summary, the estimated time allocated to each AMS Review activity is as follows:

- Planning (including risk assessment): 11.5 hours
- Fieldwork (including system analysis/walkthrough and testing/review): 94 hours
- Reporting: 33.5 hours.

Appendix 1 - Risk assessment key

1-1 Criteria for classification of consequence of ineffective performance

Source: Modified from Electricity Compliance Reporting Manual February 2022

Classification	Criteria for classification
Major	Classified on the bases that: • The consequences of ineffective performance would cause major damage, loss or disruption to customers; or • The consequences of ineffective performance would endanger or threaten to endanger the safety or health of a person.
Moderate	Classified on the basis that the consequences of ineffective performance affect the efficiency and effectiveness of the licensee's operations or service provision, but do not cause major damage, loss or disruption to customers.
Minor	Classified on the basis that: • The consequences of ineffective performance are relatively minor – i.e. ineffective performance will have minimal effect on the licensee's operations or service provision and do not cause damage, loss or disruption to customers; • Assessment of performance against the obligation is immeasurable; • The matter of ineffective performance is identified by a party other than the licensee; or • The licensee only needs to use its reasonable or best endeavours to demonstrate effective performance, or where the obligation does not otherwise impose a firm obligation on the licensee.

1-2 Likelihood ratings

Source: Review Guidelines: Electricity and Gas Licences March 2019

	Level	Criteria
A	Likely	Ineffective process or performance is expected to occur at least once or twice a year
B	Probable	Ineffective process or performance is expected to occur every three years
C	Unlikely	Ineffective process or performance is expected to occur at least once every 10 years or longer

1-3 Preliminary adequacy ratings for existing controls

Source: Review Guidelines: Electricity and Gas Licences March 2019

Level	Description
Strong	Controls mitigate the identified risks to a suitable level
Moderate	Controls only cover significant risks; improvement required
Weak	Controls are weak or non-existent and do little to mitigate the risks

Appendix 2 - Risk assessment

1. Asset Planning	
Key process	Asset planning strategies focus on meeting customer needs in the most effective and efficient manner (delivering the right service at the right price)
Outcome	Asset planning is integrated into operational or business plans, providing a framework for existing and new assets to be effectively utilised and their service optimised

Ref	Effectiveness criteria	Consequence	Likelihood	Inherent risk rating	Controls assessment	Review priority
1.1	Asset management plan covers the processes in this table	Moderate	Probable	Medium	Strong	Priority 4
1.2	Planning process and objectives reflect the needs of all stakeholders and are integrated with business planning	Moderate	Probable	Medium	Strong	Priority 4
1.3	Service levels are defined in the asset management plan	Moderate	Probable	Medium	Strong	Priority 4
1.4	Non-asset options (e.g. demand management) are considered	Minor	Unlikely	Low	Strong	Priority 5
1.5	Lifecycle costs of owning and operating assets are assessed	Minor	Probable	Low	Strong	Priority 5
1.6	Funding options are evaluated	Minor	Probable	Low	Strong	Priority 5
1.7	Costs are justified and cost drivers identified	Minor	Probable	Low	Strong	Priority 5
1.8	Likelihood and consequences of asset failure are predicted	Major	Probable	High	Strong	Priority 2
1.9	Asset management plan is regularly reviewed and updated	Minor	Probable	Medium	Moderate	Priority 5

2. Asset creation and acquisition						
Key process	Asset creation/acquisition is the provision or improvement of assets					
Outcome	The asset acquisition framework is economic, efficient and cost-effective; it reduces demand for new assets, lowers service costs and improves service delivery					
Ref	**Effectiveness criteria**	**Consequence**	**Likelihood**	**Inherent risk rating**	**Controls assessment**	**Review priority**
2.1	Full project evaluations are undertaken for new assets, including comparative assessment of non-asset options	Moderate	Probable	Medium	Strong	Priority 4
2.2	Evaluations include all life-cycle costs	Moderate	Probable	Medium	Strong	Priority 4
2.3	Projects reflect sound engineering and business decisions	Moderate	Probable	Medium	Strong	Priority 4
2.4	Commissioning tests are documented and completed	Moderate	Probable	Medium	Strong	Priority 4
2.5	Ongoing legal / environmental / safety obligations of the asset owner are assigned and understood	Moderate	Probable	Medium	Strong	Priority 4

3. Asset disposal						
Key process	Asset disposal is the consideration of alternatives for the disposal of surplus, obsolete, under-performing or unserviceable assets					
Outcome	The asset management framework minimises holdings of surplus and underperforming assets and lowers service costs. The cost-benefits of disposal options are evaluated					
Ref	**Effectiveness criteria**	**Consequence**	**Likelihood**	**Inherent risk rating**	**Controls assessment**	**Review priority**
3.1	Under-utilised and under-performing assets are identified as part of a regular systematic review process	Moderate	Probable	Medium	Strong	Priority 4
3.2	The reasons for under-utilisation or poor performance are critically examined and corrective action or disposal undertaken	Minor	Probable	Low	Strong	Priority 5
3.3	Disposal alternatives are evaluated	Minor	Unlikely	Low	Strong	Priority 5
3.4	There is a replacement strategy for assets	Moderate	Probable	Medium	Strong	Priority 4

4. Environmental analysis	
Key process	Environmental analysis examines the asset management system environment and assesses all external factors affecting the asset management system
Outcome	The asset management system regularly assesses external opportunities and threats and identifies corrective action to maintain performance requirements

Ref	Effectiveness criteria	Consequence	Likelihood	Inherent risk rating	Controls assessment	Review priority
4.1	Opportunities and threats in the asset management system environment are assessed	Moderate	Probable	Medium	Strong	Priority 4
4.2	Performance standards (availability of service, capacity, continuity, emergency response, etc.) are measured and achieved	Moderate	Probable	Medium	Strong	Priority 4
4.3	Compliance with statutory and regulatory requirements	Moderate	Probable	Medium	Strong	Priority 4
4.4	Service standard (customer service levels etc) are measured and achieved.	Moderate	Probable	Medium	Strong	Priority 4

5. Asset operations	
Key process	Asset operations is the day-today running of assets (where the asset is used for its intended purpose)
Outcome	The asset operation plans adequately document the processes and knowledge of staff in the operation of assets so service levels can be consistently achieved

Ref	Effectiveness criteria	Consequence	Likelihood	Inherent risk rating	Controls assessment	Review priority
5.1	Operational policies and procedures are documented and linked to service levels required	Moderate	Probable	Medium	Strong	Priority 4
5.2	Risk management is applied to prioritise operations tasks	Moderate	Probable	Medium	Strong	Priority 4
5.3	Assets are documented in an asset register including asset type, location, material, plans of components, and an assessment of assets' physical/structural condition	Moderate	Probable	Medium	Strong	Priority 4
5.4	Accounting data is documented for assets	Moderate	Probable	Medium	Moderate	Priority 4
5.5	Operational costs are measured and monitored	Moderate	Probable	Medium	Strong	Priority 4
5.6	Staff resources are adequate and staff receive training commensurate with their responsibilities	Moderate	Probable	Medium	Strong	Priority 4

6. Asset maintenance						
Key process	Asset maintenance is the upkeep of assets					
Outcome	The asset maintenance plans cover the scheduling and resourcing of the maintenance tasks so work can be done on time and on cost					
Ref	**Effectiveness criteria**	**Consequence**	**Likelihood**	**Inherent risk rating**	**Controls assessment**	**Review priority**
6.1	Maintenance policies and procedures are documented and linked to service levels required	Moderate	Probable	Medium	Strong	Priority 4
6.2	Regular inspections are undertaken of asset performance and condition	Major	Probable	High	Strong	Priority 2
6.3	Maintenance plans (emergency, corrective and preventative) are documented and completed on schedule	Major	Probable	High	Moderate	Priority 2
6.4	Failures are analysed and operational/maintenance plans adjusted where necessary	Major	Probable	High	Strong	Priority 2
6.5	Risk management is applied to prioritise maintenance tasks	Moderate	Probable	Medium	Strong	Priority 4
6.6	Maintenance costs are measured and monitored	Moderate	Probable	Medium	Strong	Priority 4

7. Asset management information systems						
Key process	An asset management information system is a combination of processes, data and software supporting the asset management functions					
Outcome	The asset management information system provides authorised, complete and accurate information for the day-to-day 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					
Ref	**Effectiveness criteria**	**Consequence**	**Likelihood**	**Inherent risk rating**	**Controls assessment**	**Review priority**
7.1	Adequate system documentation for users and IT operators	Minor	Probable	Low	Strong	Priority 5
7.2	Input controls include suitable verification and validation of data entered into the system	Moderate	Probable	Medium	Strong	Priority 4
7.3	Security access controls appear adequate, such as passwords	Minor	Probable	Low	Strong	Priority 5
7.4	Physical security access controls appear adequate	Minor	Probable	Low	Strong	Priority 5
7.5	Data backup procedures appear adequate and backups are tested	Moderate	Probable	Medium	Strong	Priority 4
7.6	Computations for licensee performance reporting are accurate	Minor	Unlikely	Low	Moderate	Priority 5
7.7	Management reports appear adequate for the licensee to monitor licence obligations	Minor	Probable	Low	Strong	Priority 5
7.8	Adequate measures to protect asset management data from unauthorised access or theft by persons outside the organisation	Moderate	Probable	Medium	Moderate	Priority 4

8. Risk management						
Key process	Risk management involves the identification of risks and their management within an acceptable level of risk					
Outcome	The risk management framework effectively manages the risk that the licensee does not maintain effective service standards					
Ref	**Effectiveness criteria**	**Consequence**	**Likelihood**	**Inherent risk rating**	**Controls assessment**	**Review priority**
8.1	Risk management policies and procedures exist and are applied to minimise internal and external risks	Moderate	Probable	Medium	Moderate	Priority 4
8.2	Risks are documented in a risk register and treatment plans are implemented and monitored	Moderate	Probable	Medium	Moderate	Priority 4
8.3	Probability and consequences of asset failure are regularly assessed	Major	Probable	High	Strong	Priority 2

9. Contingency planning						
Key process	Contingency plans document the steps to deal with the unexpected failure of an asset.					
Outcome	Contingency plans have been developed and tested to minimise any major disruptions to service standards.					
Ref	**Effectiveness criteria**	**Consequence**	**Likelihood**	**Inherent risk rating**	**Controls assessment**	**Review priority**
9.1	Contingency plans are documented, understood and tested to confirm their operability and to cover higher risks	Major	Probable	High	Moderate	Priority 2

10. Financial planning						
Key process	Financial brings together the financial elements of the service delivery to ensure its financial viability over the long term					
Outcome	The financial plan is reliable and provides for the long-term financial viability of the services					
Ref	**Effectiveness criteria**	**Consequence**	**Likelihood**	**Inherent risk rating**	**Controls assessment**	**Review priority**
10.1	The financial plan states the financial objectives and identifies strategies and actions to achieve those	Moderate	Probable	Medium	Strong	Priority 4
10.2	The financial plan identifies the source of funds for capital expenditure and recurrent costs	Minor	Probable	Low	Strong	Priority 5
10.3	The financial plan provides projections of operating statements (profit and loss) and statement of financial position (balance sheets)	Minor	Probable	Low	Strong	Priority 5
10.4	The financial plan provides firm predictions on income for the next five years and reasonable predictions beyond this period	Minor	Probable	Low	Strong	Priority 5
10.5	The financial plan provides for the operations and maintenance, administration and capital expenditure requirements of the services	Minor	Probable	Low	Strong	Priority 5
10.6	Large variances in actual/budget income and expenses are identified and corrective action taken where necessary	Minor	Probable	Low	Strong	Priority 5

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 for these works 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					
Outcome	The capital expenditure plan provides reliable forward estimates of capital expenditure and asset disposal income. Reasons for the decisions and for the evaluation of alternatives and options are documented					
Ref	**Effectiveness criteria**	**Consequence**	**Likelihood**	**Inherent risk rating**	**Controls assessment**	**Review priority**
11.1	There is a capital expenditure plan covering works to be undertaken, actions proposed, responsibilities and dates	Moderate	Probable	Medium	Strong	Priority 4
11.2	The capital expenditure plan provides reasons for capital expenditure and timing of expenditure	Minor	Probable	Low	Strong	Priority 5
11.3	The capital expenditure plan is consistent with the asset life and condition identified in the asset management plan	Minor	Probable	Medium	Strong	Priority 4
11.4	There is an adequate process to ensure the capital expenditure plan is regularly updated and implemented	Minor	Probable	Low	Strong	Priority 5

12. Review of asset management system						
Key process	The asset management system is regularly reviewed and updated					
Outcome	The asset management system is regularly reviewed and updated					
Ref	**Effectiveness criteria**	**Consequence**	**Likelihood**	**Inherent risk rating**	**Controls assessment**	**Review priority**
12.1	A review process is in place to ensure the asset management plan and the asset management system described in it remain current	Minor	Probable	Low	Strong	Priority 5
12.2	Independent reviews (e.g. internal audit) are performed of the asset management system	Minor	Probable	Low	Moderate	Priority 5

Appendix 3 - Previous review recommendations

The following recommendations were made by the 2017 review:

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 (ERPs) 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	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 the Risk Management suite of documents to reflect the revised Risk Management standard AS/NZS ISO 31000:2009. **Responsible Person**: Principal Mechanical Engineer WAO Powerhouse **Target Date:** 30 June 2018

Appendix B – References

Alcoa representatives participating in the review

- WA Operations Powerhouse Manager
- Senior Powerhouse Mechanical Engineer
- Senior Electrical Engineer, Powerhouse
- Energy Director – Australia
- Energy Coordinator

AAG staff participating in the review		**Hrs**
• Andrew Baldwin	Executive Director	75
• Tanuja Sanders	Senior Engineer	57
• Margaret-Mary Gauci	Senior Consultant	4
• Stephen Linden	Director (QA review)	1

Key documents and other information sources examined

- Wagerup Powerhouse Asset Strategy
- Pinjarra Powerhouse Asset Strategy
- Kwinana Powerhouse Asset Strategy
- Alcoa Powerhouse System Strategies and Asset Management Strategies (Boilers, Turbines, Turbine Alternators, Generators, HRSGs)
- Perform Boiler 3 Commissioning -Wet Commissioning BMS Comparator Interlocks Procedure (Pinjarra)
- BLR 8 Pre-Commissioning Check Sheet (Kwinana)
- BLR 8 Commission Record Sheet (Kwinana)
- BLR 8 Recommission or Cold Start (Kwinana)
- Test John Thompson Boiler Burner Management Safety Interlocks Work Instruction (Pinjarra)
- Decommission Classified Plant (WAO) Procedure
- Decommission Dangerous Goods Tanks (WAO) Procedure
- Wagerup Refinery Environmental Licence L6217/1983/15
- Wagerup Refinery Annual Environmental Reports 2017, 2018, 2019, 2020 (Triennial), 2021
- Pinjarra Refinery Environmental Licence
- Pinjarra Refinery Environmental Reports 2020, 2021
- Kwinana Refinery Environmental Licence
- Kwinana Refinery Emissions Testing Q4 2021, Q1 2022, Q2 2022
- Wagerup Powerhouse eAM-EI Asset Register
- Pinjarra Powerhouse eAM-EI Asset Register
- Kwinana Powerhouse eAM-EI Asset Register

- WA Operations Electrical Maintenance Handbook
- WA Operations MOH Tool Screenshots
- WA Operations EMM Screenshots
- Boiler Overhaul Failure Shutdown Procedure
- Wagerup Boiler Inspection documentation
- Kwinana Generator Inspection Report TA4 2021
- Kwinana Turbine Inspection Report TA4 2021
- Kwinana Boiler Inspection Report 2 2022
- Kwinana Oil Analysis Report TA2 2022
- Pinjarra Generator Inspection Report 2021
- Workorder planning checklists
- Workorder backlog reports
- Wagerup Turbine Inspection Report TA1 2021
- Kwinana Load Testing Snapshot
- Registered Pressure Equipment Statutory Inspection Summary – Boiler 3 202 Tube Failure
- Alcoa Network Share Drive Security Guidelines
- Alcoa Information & Process Control Systems - Business Continuity Policy
- Alcoa Information & Process Control Systems - Disaster Recovery Strategy
- Alcoa Regional IDM Security Access Review Process
- Alcoa IT Application Systems Disaster Recovery Planning Overview
- Alcoa Global Account Management Security Standard
- Pinjarra LCN Disaster Recovery Plan
- Pinjarra Computer Centre Disaster Recovery Plan
- Application Recovery Plan Enterprise Asset Management
- Alcoa Information Security Standard
- Alcoa Risk Management Procedure – General
- Alcoa Risk Management Overview
- Wagerup Powerhouse EHS Risk Assessment 2022
- Pinjarra Powerhouse EHS Risk Assessment 2022
- Kwinana Powerhouse EHS Risk Assessment 2022
- Alcoa Refinery Emergency Preparedness and Response Procedure
- Powerhouse Evacuation Procedure (Kwinana)
- 20 MW Black Start – Controllers Procedure (Kwinana)
- Natural Gas Emergency Procedure (Wagerup)
- Change Boiler from Gas to Diesel (Kwinana)
- Emergency Communication Procedure – DBNGP/North West Shelf Cas – Alcoa

- Powerhouse Emergency Shutdown Response Procedure (Wagerup)
- List of Equipment Shutdown Procedures
- WA Operations Energy Emergency Plan
- Evidence of Kwinana Powerhouse Compressor Undercroft Mock Rescue
- Preparing for Environmental Emergency (Pinjarra)
- Emergency Response Manual, Pinjarra Refinery
- Learning Management System training records and status reports
- Alcoa EHS Manual
- Alcoa EHS 1.10 Emergency Response Evacuation Training
- WA Operations Environmental Planning Procedure
- Monthly Forecasting Checklist
- Expense forecasts - eAM extracts and summary reports
- WA Operations 10 year budget projections for major powerhouse assets
- Alcoa Global Capital Management Standard
- Wood Group WA Powerhouse Operations review presentation to Leadership Team.