ROBINSON BOWMAKER PAUL

AUSTRALIAN ENERGY MARKET OPERATOR

INDEPENDENT ASSURANCE REPORT ON AEMO'S COMPLIANCE WITH THE GAS SERVICES INFORMATION RULES AND GSI PROCEDURES

11 SEPTEMBER 2017

Prepared by: Sue Paul, Tim Robinson

Document version: FINAL PUBLIC

Robinson Bowmaker Paul
Level 8
104 The Terrace
Wellington 6011
New Zealand
www.robinsonbowmakerpaul.com

EXECUTIVE SUMMARY

This independent assurance report sets out the results of the market audit by Robinson Bowmaker Paul (RBP) assessing AEMO's compliance with the Gas Services Information (GSI) Rules and GSI Procedures.

AUDITED ENTITY

The audited entity for this report is AEMO.

AUDIT PERIOD

The Audit Period is 1 July 2016 to 30 June 2017, both dates inclusive.

REGULATORY CONTEXT AND SCOPE

Regulatory context

The regulatory context for the audit is summarised in the table below.

Table 1: Regulatory context for the market audit

Rule reference	Comment
174 (1)	Requirement for AEMO to appoint market auditor at least annually
174(2)	Defines the scope of the Audit to include, at minimum: • the compliance of AEMO's Internal Procedures and business processes with the GSI Rules • AEMO's compliance with the GSI Rules and Procedures AEMO's software systems for the Gas Bulletin Board (GBB) and the calculation of GSI Fees and processes for software management

Scope

Given the regulatory context above, the purpose of the GSI Compliance Audit is to assess:

- How AEMO implements its obligations under the GSI Rules
- How AEMO manages non-compliance risk with respect to the obligations above

- Instances of non-compliance by AEMO during the Audit period.
- AEMO's market software systems and its processes for software management. It includes an assessment of whether:
  - AEMO maintains appropriate records
  - The software used by AEMO to implement its obligations under the GSI Rules is compliant with the underlying mathematical formulations and the GSI Rules themselves.
  - AEMO has been compliant with its market systems certification obligations

The GSI Compliance Audit includes the following work streams:

- Compliance Assessment of AEMO's operational compliance and application of controls to mitigate compliance risk
- Procedures Assessment of GSI Procedures and Internal Procedures that have changed during the Audit Period
- Software Compliance Assessment.
- Review of General IT Controls.

AUDIT CRITERIA

Criteria for determining operational and procedural compliance

The criterion we have used for determining the compliance of AEMO's GSI Procedures (referred to as the *GSI Procedures*) is the Gas Services Information Rules dated 26 November 2016 (referred to as the *GSI Rules*).

The criteria we have used for determining AEMO's operational compliance and the compliance of AEMO's Internal Procedures are the GSI Rules and the GSI Procedures.

Criteria for determining control application

When assessing whether AEMO has applied effective controls during the Audit Period we have used relevant Internal Procedure and Confluence Work Instruction documentation as our audit criteria. This includes the following:

Table 2: Procedures reviewed to assess control application

AEMO functional area	Procedures against which control application have has been assessed
Market Operations	Daily Operations Procedure

AEMO functional area	Procedures against which control application have has been assessed
	Rerunning GBB Reports GSI Budget Work Instructions
System Capacity	Preparation of GSOO Procedure
Finance	Determination of AEMO Budget Procedure and Fees Procedure
IT	Access Control and Authentication Standard, AEMO AD Domain Administrator Access Procedure, Application Security Standard, Backup Standard, Cyber Security Policy, Encryption Standard, Information Handling Guidelines, IT Security Incident Response Procedure, Logging and Log Management Standard, Malware Protection Standard, Mobile Computing and Remote Access Security Standard, Network Security Standard, Patch Management Standard, Secure Deletion and Disposal Standard, Workstation Security Standard, IT Change Management Policy, Incident Management Policy, Problem Management Policy, Software Configuration Management Plan

Where AEMO does not have documented controls or procedures relating to a business process under review we have used best practice criteria for a prudent market operator. This includes:

- The use of automated/semi-automated tools to reduce risk of errors
- Use of automated alerts or calendar reminders
- Approval and authorisation processes
- Issue escalation processes
- Validation and review processes
- Exception reporting

APPROACH

Assurance

Our audit has been conducted in accordance with Australian Auditing and Assurance Standards Board's '*Framework for Assurance Engagements*', ASAE 3000 '*Assurance Engagements Other than Audits and Reviews of Financial Information*'.

- We provide reasonable assurance under this standard with respect to our review of:
  - The compliance of the AEMO's Internal Procedures with the GSI Rules
  - The AEMO's software changes and the compliance of AEMO's market software with the GSI Rules and GSI Procedures

- We provide limited assurance under this standard with respect to our review of:
  - The AEMO's compliance with the GSI Rules and GSI Procedures
  - The AEMO's software management processes and controls

Risk ratings and materiality

Compliance and risk ratings

Table 3: Compliance and risk rating definitions

Compliance rating
1: Instances of non-compliance with the GSI Rules
2: Findings that are not an instance of non-compliance, but pose compliance risk
3: Findings related to minor housekeeping issues that do not affect compliance risk

Risk Rating
Critical: Potential for catastrophic impact on market or system operations or other market outcomes if not addressed immediately. Requires executive actions and monitoring at board level.
Significant: Potential for major impact on market or system operations or other market outcomes if not addressed as a matter of priority. Requires senior management attention with regular monitoring at executive meetings.
Medium: Potential for moderate impact on market or system operations or other market outcomes if not addressed within a reasonable timeframe. Requires management attention with regular monitoring.
Low: Potential for minor impact on market or system operations or other market outcomes if not addressed in the future. Requires team level attention with regular monitoring.

Materiality (qualification of audit opinion)

In determining whether to qualify our opinion on whether AEMO has complied "in all material respects", we have taken the following factors into account:

- Purpose and objectives of the market audit
- AEMO's overall objectives
- AEMO's risk matrix definitions of impact
- Financial impacts on Gas Market Participants
- The number of Gas Market Participants or other stakeholders affected
- The impact of an issue on market objectives such as transparency, equity and efficiency
- Whether an issue is systemic
- Whether an issue is recurring (from previous audits)

Audit activities

We have undertaken a combination of:

- Reviewing self-reported incidents of AEMO non-compliance with the GSI Rules and GSI Procedures
- Business process walkthroughs and interviews with staff
- Reviewing AEMO's GSI Procedures, Internal Procedures and IT Procedures to ensure GSI Rules changes and other changes (e.g. processes, systems, etc.) have been reflected in the procedures.
- Compliance testing to audit AEMO's operational compliance with the GSI Rules and GSI Procedures and to determine the effectiveness of operating controls[1].

The first two activities were conducted as part of two field-visits (one undertaken in March 2017 and the other in June 2017). Remaining activities have been undertaken remotely.

Compliance testing and business process walkthroughs were focussed on subset of functional areas based on residual compliance risk, materiality, and rule changes occurring in the Audit Period. These areas include:

Table 4: Audit focus areas

AEMO functional area	Focus area
Market Operations	Daily GBB Operations Calculation of GSI Fees (initial and adjustment)
System Capacity	Preparation and publication of the GSOO report
Finance	Calculation and publication of GSI budget and market fees (considering recent changes in fee categories)
IT	Business continuity, service management, and user-facing information security policies and procedures

[1] In doing so, we have sourced information from all AEMO (WA) teams, with a particular emphasis on the market operations team.

AUDIT FINDINGS

Comment

Continuing improvement in compliance management practices

We continue to note increasing levels of maturity in managing compliance and a strong compliance culture.

- Audit findings from previous years have been consistently addressed and closed with no material recurring themes noted. The majority of medium risk audit findings from the current Audit Period have been addressed and closed promptly.
- There have only been four instances of minor non-compliance (i.e. compliance rating 1 findings, all of which have a low risk rating) with the GSI Rules and GSI Procedures, half of which have been self-reported by AEMO; this speaks to both the effectiveness of AEMO's detective controls and strong compliance culture.
- Our site visits have indicated that AEMO teams maintain and apply effective controls to manage compliance risk.

Scope to improve business continuity planning and testing

AEMO maintains redundant IT systems, so that the market can continue to operate in the event of losing one data centre. Both data centres are regularly exercised, by running production market systems from each location at regular intervals. While this is perhaps the most critical part of AEMO's business continuity preparation, other aspects of business continuity have not been explored. We have not seen evidence of any business continuity testing beyond system failover and backup restoration testing. This means that reliance on key people, office premises, physical equipment, and communications channels has not been tested.

AEMO has initiated an organisation wide review and update of Business Continuity Plans as part of its move to a new organisational structure.

Summary

Table 5 below summarises the total number of audit findings (broken down by risk rating) reported during the 2015/16 and 2016/17 Audit Periods.

Note that in Table 5, of the 13 reported findings for 2016/17, six findings relate to the review of AEMO's general IT controls; likewise, of the eight open findings, five relate to the review of AEMO's

general IT controls. Please note that these findings are also reported in the 2016/17 Electricity Compliance Audit Report and apply to the GSI Compliance Audit as well.

Table 5: Audit finding summary by risk rating and open/closed status, 2015/16 and 2016/17.

	2015/16 Findings	2016/17 Findings		
Risk Rating	Total	Total	Closed	Open
Significant	0	0	0	0
Medium	0	1	0	1
Low	3	12	5	7
Total	3	13	5	8

Table 6: Summary of audit findings

Ref	Issue type & process	Risk & Compliance Rating	Finding	Recommendation
17 GSI 2.01	**Issue Type** RBP & AEMO reported non-compliance **Process** Market Operations	**Risk Rating** Low **Compliance Rating** 1	Two instances of early publication of GBB reports due to error during manual report rerun	No recommendations – AEMO is pursuing appropriate remediating actions
17 GSI 2.02	**Issue Type** RBP reported non-compliance **Process** Finance	**Risk Rating** Low **Compliance Rating** 1	Failure to publish GSI Financial Report	Update Internal Procedures to document this process
17 GSI 2.03	**Issue Type** AEMO Self-reported non-compliance **Process** Market Operations	**Risk Rating** Low **Compliance Rating** 1	GSI Fees adjustment calculated incorrectly (Q1 2017) due to error in procedure	No recommendations – AEMO has updated procedures to correct error
17 GSI 2.04	**Issue Type** N/A **Process** Finance	**Risk Rating** Low **Compliance Rating** 2	GSI invoicing process (finance) manual with some risk of error	• Document the process used to create invoices including validation/error checking controls • Investigate ways to enhance the efficiency of the invoice creation process and to reduce the amount of manual manipulation

Ref	Issue type & process	Risk & Compliance Rating	Finding	Recommendation
17 GSI 2.05	**Issue Type** N/A **Process** System Capacity	**Risk Rating** Low **Compliance Rating** 2	Validation processes for GSOO data registers are undocumented	No recommendations - AEMO has updated the relevant procedure
17 GSI 2.06	**Issue Type** N/A **Process** System Capacity	**Risk Rating** Low **Compliance Rating** 2	Documentation for GSOO Data Collection process can be improved	No recommendations - AEMO has updated the relevant procedure
17 GSI 2.07	**Issue Type** N/A **Process** Various	**Risk Rating** Low **Compliance Rating** 3	Missing obligations in AEMO's Internal Procedures	AEMO should update the relevant Internal Procedures to pick up gaps and transitional rule changes
17 WEM 2.39	**Issue Type** N/A **Process** IT	**Risk Rating** Low **Compliance Rating** 2	Documentation for backup architecture not available	Ensure that current backup refresh project delivers documentation for the architecture of the backup environment
17 WEM 2.40	**Issue Type** N/A **Process** IT	**Risk Rating** Medium **Compliance Rating** 2	Business continuity exercises are limited to system failovers	Plan and conduct regular desk-based and live business continuity exercises covering selected credible contingency scenarios
17 WEM 2.41	**Issue Type** N/A	**Risk Rating** Low	WA backup media not encrypted as required by AEMO Encryption Standard	• Consider backup media encryption as part of backup refresh project.

Ref	Issue type & process	Risk & Compliance Rating	Finding	Recommendation
	Process General	**Compliance Rating** 2		
17 WEM 2.43	**Issue Type** N/A **Process** IT	**Risk Rating** Low **Compliance Rating** 3	New IT applications staff have had limited exposure to service management concepts	Ensure support staff have appropriate service management training
17 WEM 2.44	**Issue Type** N/A **Process** IT	**Risk Rating** Low **Compliance Rating** 3	Configuration management system could be improved	• Ensure support staff have appropriate service management training • Consider refreshing CMDB as part of the wider AEMO service management programme
17 WEM 2.45	**Issue Type** N/A **Process** IT	**Risk Rating** Medium **Compliance Rating** 2	One data centre is not Tier III aligned	Consider moving to a more distant Tier III aligned data centre site as part of next data centre lifecycle refresh project.

OPINION

Qualifications

We have no qualifications to note with respect to the opinions provided below.

Conclusion

Opinion on the compliance of AEMO's GSI and Internal Procedures with the GSI Rules

Subject to the inherent limitations set out in Section 1.5.4, based on the audit procedures we have performed and the evidence we have examined, AEMO's GSI Procedures and Internal Procedures are compliant with the GSI Rules.

Opinion on AEMO's operational compliance with the GSI Rules and GSI Procedures

Subject to the inherent limitations set out in Section 1.5.4, based on the audit procedures we have performed and the evidence we have examined, nothing has come to our attention that causes us to believe AEMO has not been compliant with the GSI Rules and GSI Procedures during the Audit Period, in all material respects

Opinion on the compliance of AEMO's Market Software Systems with the GSI Rules

Based on the audit procedures we have performed and the evidence we have examined, AEMO's Market Software Systems are compliant with the GSI Rules in all material respects.

Opinion with respect to the compliance of AEMO's software management processes with the GSI Rules

Subject to the inherent limitations set out in Section 1.5.4, based on the audit procedures we have performed and the evidence we have examined, nothing has come to our attention that causes us to believe that AEMO's processes for software management have not been compliant with the GSI Rules and GSI Procedures during the Audit Period in all material respects.

CONTENTS

1 INTRODUCTION

This chapter sets out the regulatory context for the GSI Compliance Audit and our approach to performing the audit.

1.1 AUDITED ENTITY

The audited entity for this report is AEMO.

1.2 AUDIT PERIOD

The Audit Period is 1 July 2016 to 30 June 2017, both dates inclusive.

1.3 REGULATORY CONTEXT AND SCOPE

1.3.1 Regulatory context

The regulatory context for the audit is summarised in the table below.

Table 7: Regulatory context for the market audit[2]

Rule reference	Comment
174 (1)	Requirement for AEMO to appoint market auditor at least annually
174(2)	Defines the scope of the Audit to include, at minimum: • the compliance of AEMO's Internal Procedures and business processes with the GSI Rules • AEMO's compliance with the GSI Rules and Procedures • AEMO's software systems for the Gas Bulletin Board (GBB) and the calculation of GSI Fees and processes for software management

1.3.2 Scope

Given the regulatory context above, the purpose of the GSI Compliance Audit is to assess:

[2] Rules references are as at 31 May 2017 unless otherwise indicated

- How AEMO implements its obligations under the GSI Rules
- How AEMO manages non-compliance risk with respect to the obligations above
- Instances of non-compliance by AEMO during the Audit Period.
- AEMO's market software systems, its processes for software management, and its general IT controls. It includes an assessment of whether:
  - AEMO maintains appropriate records
  - The software used by AEMO to implement its obligations under GSI Rules is compliant with the underlying mathematical formulations and the GSI Rules themselves.
  - AEMO has been compliant with its market systems certification obligations

The GSI Compliance Audit includes the following work streams:

- Compliance Assessment of:
  - Areas where we have noted breaches or non-compliance risk during past audits.
  - Areas that have changed or been introduced in the past Audit Period (e.g. in terms of rule changes, system changes, operational practice changes
  - AEMO's self-reported instances of non-compliance with the GSI Rules
  - Areas of potential risk identified by Gas Market Participants during the Stakeholder Session on 23 March 2017.
- Procedures Assessment of GSI Procedures and Internal Procedures that have changed during the Audit Period.
- Software Compliance Assessment. We reviewed the software used to meet obligations under the GSI Rules. In particular, we:
  - Reviewed AEMO's Market Systems (used to implement GSI obligations), and in particular the nature of changes to the Gas Bulletin Board (GBB) software and GSI Fees tool to assess compliance with Part 1 Rule 19(1) of the GSI Rules
  - Reviewed AEMO's software management processes.
- Review of General IT Controls. This year we have broadened the scope of our software management process review to encompass general IT controls not reviewed (or reviewed only in part) in previous years. This review covers:
  - Change and release management for all AEMO WA systems
  - Incident and problem management
  - Backup arrangements, retention and restoration

- Authentication, authorisation and access management
- Database management
- User-facing information security controls

1.4 Audit Criteria

1.4.1 Criteria for determining operational and procedural compliance

The criterion we have used for determining the compliance of AEMO's GSI Procedures (referred to as the *GSI Procedures*) is the Gas Services Information Rules dated 26 November 2016 (referred to as the *GSI Rules*).

The criteria we have used for determining AEMO's operational compliance and the compliance of AEMO's Internal Procedures are the GSI Rules and the GSI Procedures.

1.4.2 Criteria for determining control application

When assessing whether AEMO has applied effective controls during the Audit Period we have used relevant Internal Procedure and Confluence Work Instruction documentation as our audit criteria. This includes the following:

Table 8: Procedures reviewed to assess control application

AEMO functional area	Procedures against which control application have has been assessed
Market Operations	Daily Operations Procedure Rerunning GBB Reports GSI Budget
System Capacity	Preparation of GSOO Procedure
Finance	Determination of AEMO Budget Procedure and Fees Procedure
IT	Access Control and Authentication Standard, AEMO AD Domain Administrator Access Procedure, Application Security Standard, Backup Standard, Cyber Security Policy, Encryption Standard, Information Handling Guidelines, IT Security Incident Response Procedure, Logging and Log Management Standard, Malware Protection Standard, Mobile Computing and Remote Access Security Standard, Network Security Standard, Patch Management Standard, Secure Deletion and Disposal Standard, Workstation Security Standard, IT Change Management Policy, Incident Management Policy, Problem Management Policy, Software Configuration Management Plan

Where AEMO does not have documented controls or procedures relating to a business process under review we have used best practice criteria for a prudent market operator. This includes:

- The use of automated/semi-automated tools to reduce risk of errors
- Use of automated alerts or calendar reminders
- Approval and authorisation processes
- Issue escalation processes
- Validation and review processes
- Exception reporting
- Practices at other market operators with which we are familiar.

1.5 Approach

1.5.1 Assurance

Our audit has been conducted in accordance with Australian Auditing and Assurance Standards Board's '*Framework for Assurance Engagements*', ASAE 3000 '*Assurance Engagements Other than Audits and Reviews of Financial Information*'.

- We provide reasonable assurance under this standard with respect to our review of:
  - The compliance of the AEMO's Internal Procedures with the GSI Rules
  - The AEMO's software changes and the compliance of AEMO's market software systems with the GSI Rules and GSI Procedures
- We provide limited assurance under this standard with respect to our review of:
  - The AEMO's compliance with the GSI Rules and GSI Procedures
  - The AEMO's software management and general IT processes and controls.

1.5.2 Risk ratings and materiality

Compliance and risk ratings

Audit findings are categorised as follows:

Table 9: Compliance and risk rating definitions

Compliance rating
1: Instances of non-compliance with the GSI Rules
2: Findings that are not an instance of non-compliance, but pose compliance risk
3: Findings related to minor housekeeping issues that do not affect compliance risk

Risk Rating
Critical: Potential for catastrophic impact on market or system operations or other market outcomes if not addressed immediately. Requires executive actions and monitoring at board level.
Significant: Potential for major impact on market or system operations or other market outcomes if not addressed as a matter of priority. Requires senior management attention with regular monitoring at executive meetings.
Medium: Potential for moderate impact on market or system operations or other market outcomes if not addressed within a reasonable timeframe. Requires management attention with regular monitoring.
Low: Potential for minor impact on market or system operations or other market outcomes if not addressed in the future. Requires team level attention with regular monitoring.

Further information on risk and compliance ratings is provided in Appendix A.

Materiality (qualification of audit opinion)

In determining whether to qualify our opinion on whether AEMO has complied "in all material respects", we have taken the following factors into account:

- Purpose and objectives of the market audit
- AEMO's overall objectives
- AEMO's risk matrix definitions of impact
- Financial impacts on Gas Market Participants
- The number of Gas Market Participants or other stakeholders affected
- The impact of an issue on market objectives such as transparency, equity and efficiency
- Whether or not an issue is systemic
- Whether or not an issue is recurring (from previous audits)

1.5.3 Audit activities

We have undertaken a combination of:

- Reviewing self-reported incidents of AEMO non-compliance with the GSI Rules and GSI Procedures

- Business process walkthroughs and interviews with staff to audit the application of operating controls and to determine the level of compliance risk associated with selected business processes.
- Reviewing AEMO's GSI Procedures, Internal Procedures and IT Procedures to ensure GSI Rules changes and other changes (e.g. processes, systems, etc.) have been reflected in the procedures.
- Compliance testing to audit AEMO's operational compliance with the GSI Rules and GSI Procedures and to determine the effectiveness of operating controls. In doing so, we have sourced information from all AEMO (WA) teams, with a particular emphasis on the market operations team.

The first two activities were conducted as part of two field-visits (one undertaken in March 2017 and the other in June 2017). Remaining activities have been undertaken remotely.

Compliance testing and business process walkthroughs were focussed on subset of functional areas based on residual compliance risk, materiality, and rule changes occurring in the Audit Period. These areas include:

Table 10: Audit focus areas

AEMO functional area	Focus area
Market Operations	Daily GBB Operations Calculation of GSI Fees (initial and adjustment)
System Capacity	Preparation and publication of the GSOO report
Finance	Calculation and publication of GSI budget and market fees (considering recent changes in fee categories)
IT	Business continuity, service management, and user-facing information security policies and procedures

1.5.4 Inherent limitations

As in previous years, we note that there are limitations to any external audit. Audits are not an absolute guarantee of the truth or reliability of agency information or the effectiveness of internal controls. They may not identify all matters of significance. This is because external audit techniques involve:

- Professional judgement as to "good industry and market operational practice"
- The use of sample testing
- An assessment of the effectiveness of internal control structures and
- An assessment of risk.

A market audit does not guarantee every procedure and action carried out in the operation of the market in the audit report, nor does it examine all evidence and every transaction. However, our audit procedures should identify errors or omissions significant enough to adversely affect market outcomes.

Our opinion with respect to AEMO's compliance with the GSI Rules and GSI Procedures is therefore subject to the following caveats:

- Our audit procedures did not include assessing irregularities such as fraudulent or illegal activities. As such, our audit should not be relied upon to disclose such irregularities. However, if we were to detect any fraudulent or illegal activity, we would report this to AEMO. No such findings have been made during this audit.
- Our audit is not designed to detect all weaknesses in control procedures as it is not performed continuously throughout the Audit Period and is performed on a sample basis.

1.6 Structure of this report

The remainder of this report is structured as follows:

- Chapters 2 to 11 present our audit findings relating to the Compliance Assessment and Procedures Assessment work streams on an GSI Rule Chapter by Chapter basis.
- Chapter 12 presents findings relating to the IT work streams

1.7 Acknowledgments

RBP would like to thank AEMO managers and staff who willingly provided information and shared in discussions with us while we carried out this audit.

2 PART 1 – INTRODUCTORY & ADMINISTRATIVE MATTERS

Part 1 of the GSI Rules sets out the Introduction to the GSI Rules and covers areas such as the objectives of the market, conventions and transitional arrangements.

2.1 RULE AMENDMENTS

There have been transitional changes to Part 1 to reflect reallocation of obligations across AEMO, the Independent Market Operator (IMO) and the Economic Regulation Authority (ERA).

2.2 AEMO PROCEDURES

AEMO's GSI Procedures and Internal Procedures are compliant with Part 1 of the GSI Rules in all material respects.

2.3 OPERATIONAL COMPLIANCE WITH PART 1

We have not conducted any audit procedures to assess AEMO's compliance with Part 1 of the GSI Rules.

There have been no self-reported instances of non-compliance with Part 1.

3 PART 2 - REGISTRATION

Part 2 of the GSI Rules covers the registration of Gas Market Participants and facilities, including registration, deregistration, transfers, and exemptions.

3.1 RULE AMENDMENTS

There have been transitional changes to Part 2 to reflect reallocation of obligations across AEMO, the Independent Market Operator (IMO) and the Economic Regulation Authority (ERA).

3.2 AEMO PROCEDURES

AEMO's GSI Procedures and Internal Procedures are compliant with Part 2 of the GSI Rules in all material respects.

3.3 OPERATIONAL COMPLIANCE WITH PART 2

We have not conducted any audit procedures to assess AEMO's compliance with Part 2 of the GSI Rules.

There have been no self-reported instances of non-compliance with Part 2.

4 Part 3 – Provision of information for GBB

Part 3 of the GSI Rules deals with the GBB information requirements pertaining to Gas Market Participants and the various classes of Facilities.

4.1 Rule amendments

There have been no amendments to Part 3.

4.2 AEMO procedures

AEMO's GSI Procedures and Internal Procedures are compliant with Part 3 of the GSI Rules in all material respects.

4.3 Operational Compliance with Part 3

AEMO has limited obligations under Part 3; the obligations are all automated via the GBB which is certified. Therefore, we have not conducted any audit procedures to assess AEMO's compliance with Part 3 of the GSI Rules.

There have been no self-reported instances of non-compliance with Part 3.

5 Part 4 – The Gas Bulletin Board

Part 4 of the GSI Rules describes the information that is required to be published on the Gas Bulletin Board.

5.1 Rule amendments

There have been no amendments to Part 4.

5.2 AEMO procedures

AEMO's GSI Procedures and Internal Procedures are compliant with Part 4 of the GSI Rules in all material respects.

5.3 Operational Compliance with Part 4

5.3.1 Audit activities

- We conducted a (real-time) business process walkthrough to determine whether AEMO has complied with Part 4 of the GSI Rules and its Internal Procedure (relating to daily GBB Operations) and whether AEMO has applied appropriate controls when conducting the daily market operations shift.
- Reviewed system logs to compliance test whether AEMO has published daily and monthly GBB reports in accordance with Part 4.
- Reviewed AEMO's procedures for rerunning GBB reports when there are errors/omissions in data submission and reports must be recreated manually.

5.3.2 Audit findings

Instances of non-compliance and areas of compliance risk associated with Part 4 are summarised in the table below.

Table 11: Operational compliance findings associated with Part 4 of the GSI Rules

Ref	Issue Type & Obligation	Risk & Compliance Rating	Finding	Recommendation
17 GSI 2.01	**Issue Type** AEMO & RBP reported non-compliance (New issue) **Obligation** Section 4.3.5 of GSI Procedure Operation of the Gas Bulletin Board (WA) and the Emergency Management Facility	**Risk Rating** Low **Compliance Rating** Level 1	**Two instances of early publication of GBB reports due to error during manual report rerun**. There have been two instances where GBB reports have been released early to the market due to human error in rerunning GBB reports to incorporate data that has been submitted late. AEMO's procedures state explicitly the process that must be followed in such instances but due to human error this process was not followed. AEMO is pursuing a number of remediating actions including: • Emailing and reminding teams of process to follow when rerunning GBB reports and the importance of following the work instructions • Requesting improved validation functionality in the release of GBB version 1.9	No recommendations – AEMO is pursuing appropriate remediating actions.

6 Part 5 – Emergency management facility

Part 5 of the GSI Rules describes the operation of the Emergency Management Facility (EMF), the information that is to be published on the EMF, and the access requirements and limitations.

6.1 Rule amendments

There have been no amendments to Part 5 of the GSI Rules.

6.2 AEMO procedures

AEMO's GSI Procedures and Internal Procedures are compliant with Part 5 of the GSI Rules in all material respects.

6.3 Operational Compliance with Part 5

We have not conducted any audit procedures to assess AEMO's compliance with Part 5 of the GSI Rules.

There have been no self-reported instances of non-compliance with Part 5.

7 PART 6 – THE GAS STATEMENT OF OPPORTUNITIES

Part 6 of the GSI Rules describes the high-level requirements for the publication and content of the Gas Statement of Opportunities (GSOO).

7.1 RULE AMENDMENTS

There have been no amendments to Part 6 of the GSI Rules.

7.2 AEMO PROCEDURES

AEMO's GSI Procedures and Internal Procedures are compliant with Part 6 of the GSI Rules in all material respects.

7.3 OPERATIONAL COMPLIANCE WITH PART 6

7.3.1 Audit activities

- We conducted a (retrospective) business process walkthrough to determine whether AEMO has complied with the GSI Rules and its Internal Procedures and whether AEMO has applied appropriate controls when preparing the 2016 GSOO report.
- We reviewed the 2016 GSOO report to ensure its contents were consistent with the requirements of Part 6 of the GSI Rules.

7.3.2 Audit findings

Areas of compliance risk associated with Part 6 are summarised in the table below.

There have been no self-reported instances of non-compliance with Part 6.

Table 12: Operational compliance findings associated with Part 6 of the GSI Rules

Ref	Issue Type & Obligation	Risk & Compliance Rating	Finding	Recommendation
17 GSI 2.05	Issue Type RBP reported compliance issue Obligation N/A (New issue)	Risk Rating Low Compliance Rating 2	Validation processes for GSOO data registers are undocumented. AEMO staff undertake a range of validation processes to ensure the data registers used in the GSOO processes are correct. This includes historical comparisons, checking for manifest errors as well as verification by senior analysts. During site visits we noted these validation procedures are not documented in the GSOO procedures. AEMO has since documented validation procedures in the GSOO Internal Procedure.	No recommendations – the relevant Internal Procedure has been updated to incorporate this recommendation.
17 GSI 2.06	Issue Type RBP reported compliance issue Obligation Rule 103, Rule 104 (New issue)	Risk Rating Low Compliance Rating 2	Documentation for GSOO Data Collection process can be improved. Data for the GSOO is obtained from multiple sources including the GBB, AEMO subscriptions, public website, AEMO contract data, Gas Market Participants and external (forecasting) consultants. During site visits we noted that the GSOO procedure did not reflect accurately the data collection process. As data collection is a crucial part of the GSOO, it should be documented at a high level at least (precise data requirements may change from year to year so there is limited value in documenting the process in detail). AEMO has since documented the data collection process in the GSOO Internal Procedure.	No recommendations – the relevant Internal Procedure has been updated to incorporate this recommendation.

8 Part 7 – Budget and fees

Part 7 of the GSI Rules covers AEMO's allowable revenue, budget and fees.

8.1 Rule amendments

Amendments to Part 7 include only transitional changes to reflect the transfer of IMO functions to the ERA.

8.2 AEMO procedures

AEMO's GSI Procedures and Internal Procedures are compliant with Part 7 of the GSI Rules in all material respects.

We have noted a small number of obligations that are undocumented.

Table 13: Procedural findings associated with the GSI Rules

Ref	Finding	Risk & Compliance Rating	Recommendation
17GSI2.07	A small number of obligations are undocumented	Low Level 3	AEMO should update its procedures to document the missing obligations.

8.3 Operational compliance with Part 7

8.3.1 Audit activities

- We have conducted (retrospective) business process walkthroughs to determine whether AEMO has complied with the GSI Rules and its Internal Procedures and whether AEMO has applied appropriate controls in the following areas:
  - Determination and publication of AEMO budget (Part 7, Division 3 of the GSI Rules)
  - Preparation and sending of GSI fees invoices (Part 7, Division 4 of the GSI Rules)

- We have reviewed GSI initial and adjustment invoices for one quarter to check whether Gas Market Participants were invoiced for the correct amounts.
- We have reviewed the GSI Fees Tool to evaluate whether the fees calculations are compliant with rule 116 of the GSI Rules. See also Section 12.2.

8.3.2 Audit findings

Instances of non-compliance and areas of compliance risk associated with Part 7 are summarised in the table below.

Table 14: Operational compliance findings associated with Part 7 of the GSI Rules

Ref	Issue Type & Obligation	Risk & Compliance Ratings	Finding	Recommendation
17 GSI 2.02	**Issue Type** RBP reported compliance issue **Obligation** Rule 111(1)(b) (New issue)	**Risk Rating** Low **Compliance Rating** 1	Failure to publish historical GSI Financial Report. The GSI Rules require AEMO to publish by 30 October a historical financial report comparing actuals to budgeted amounts. AEMO failed to publish the GSI Financial Report for the 2015/16 financial year on 30 October 2016 due to an oversight. Other GSI budgeting and fee obligations follow the overall AEMO budget cycle which happens to be aligned to the rule mandated timelines (i.e. all budgets and fees published by end of the financial year (30 June)). The historical financial reports are unique to WA and do not follow the financial year cycle – hence oversight and failure to publish is possible without adequate controls. AEMO published the 2015/16 historical financial report in June 2017 and has instituted calendar alerts to ensure the breach does not recur.	AEMO should update its Internal Procedures to document this process
17 GSI 2.03	**Issue Type** AEMO Self-reported non-compliance **Obligation**	**Risk Rating** Low **Compliance Rating** 1	GSI Fees adjustment calculated incorrectly (Q1 2017) due to error in procedure. AEMO calculated GSI fee adjustments using incorrect Aggregated Shipper Delivery Quantities for Q1 2016 in Q1 2017 as a result of a manual error. AEMO's documented procedures for calculating GSI fees adjustments were incorrect where AEMO issued a corrected initial invoice under GSI Rule 118(2). The procedure specified	No recommendations – AEMO has implemented adequate remedial actions.

Ref	Issue Type & Obligation	Risk & Compliance Ratings	Finding	Recommendation
	Rule 116(2) (New issue)		incorrectly the date range for the data to be extracted for adjustment calculation when a correction has been undertaken for the initial invoice run under rule 118(2) of the GSI Rules. As a result, incorrect adjustment invoices were sent out for the Q1 2016 invoice adjustment. Gas Market Participants have been told to ignore the adjustment invoices. Hence, there was no adverse financial impact. AEMO has updated its procedures to reflect correct date ranges when a corrected initial invoice is issued under rule 118(2) of the GSI Rules and has also reminded staff of the process to follow when an invoice is rerun under rule 118(2) of the GSI Rules.	
17 GSI 2.04	**Issue Type** RBP reported compliance issue **Obligation** Rule 117 (New issue)	**Risk Rating** Low **Compliance Rating** 2	GSI invoicing process is manual with some risk of error. AEMO uses a certified semi-automated tool to calculate GSI fees payable and to generate invoice summaries. These summaries are then converted into Gas Market Participant invoices using an undocumented manual process to create invoices based on the outputs of the GSI fees tool. The process involves manually inputting hard-coded formula to calculate total fees payable based on the initial and adjustment fees calculated by the GSI fees tool. Further manual manipulation is further required if a Gas Market Participant has multiple facilities due to the shortcomings of the invoicing tools. We note that AEMO does conduct validation and error checking by comparing final invoice amounts to the invoiced summaries produced by the GSI fees tool. However, given the volume of data such validation may miss errors.	• Document the process used to create invoices including validation/error checking controls • Investigate ways to enhance the efficiency of the invoice creation process and to reduce the amount of manual manipulation

9 Part 8 – Rule changes

Part 8 of the GSI Rules details the process for making changes to the GSI Rules.

9.1 Rule amendments

Amendments to Part 8 include only transitional changes to reflect the transfer of IMO functions to the ERA.

9.2 AEMO procedures

AEMO has no obligations under Part 8 of the GSI Rules. Therefore, AEMO has no procedures relating to Part 8.

9.3 Operational Compliance with Part 8

As noted above, AEMO has no obligations under Part 8 of the GSI Rules. Therefore, we have conducted no audit activities in relation to Part 8.

10 PART 9 – GSI PROCEDURES

Part 9 of the GSI Rules details the process for developing and changing GSI Procedures.

10.1 RULE AMENDMENTS

Amendments to Part 9 include only transitional changes to reflect the transfer of IMO functions to the ERA.

10.2 AEMO PROCEDURES

AEMO's GSI Procedures and Internal Procedures are compliant with Part 9 of the GSI Rules in all material respects. Please refer to Table 13Table 13 for audit findings relating to AEMO's procedures

10.3 OPERATIONAL COMPLIANCE WITH PART 9

No procedure changes have been progressed or implemented during the Audit Period. Therefore, we have conducted no audit activities relating to Part 9.

There have been no self-reported instances of non-compliance with Part 9.

11 PART 10 – COMPLIANCE AND ENFORCEMENT

Part 10 of the GSI Rules describes the monitoring, investigating and enforcing compliance of Gas Market Participants with the GSI Rules and GSI Procedures. It also covers auditing of AEMO's own compliance.

11.1 RULE AMENDMENTS

Amendments to Part 10 include only transitional changes to reflect the transfer of IMO functions to the ERA.

11.2 AEMO PROCEDURES

AEMO's GSI Procedures and Internal Procedures are compliant with Part 10 of the GSI Rules in all material respects. Please refer to Table 13Table 13 for audit findings relating to AEMO's procedures.

11.3 OPERATIONAL COMPLIANCE WITH PART 10.

We have conducted no audit activities relating to Part 10.

There have been no self-reported instances of non-compliance with Part 10.

12 GSI SYSTEMS AND IT CONTROLS

This chapter covers the compliance of AEMO's software systems for the GBB and GSI Fees calculations and software management processes with the GSI Rules and GSI Procedures, in accordance with rule 174(2)(c) of the GSI Rules.

- Section 12.1 sets out our review of AEMO's software systems for the GBB and the calculation of GSI Fees
- Section 12.2 sets out our review of AEMO's general IT controls, including processes for software management.

12.1 COMPLIANCE OF AEMO SOFTWARE

The software testing and certification process assesses whether the mathematical formulations specified in the GSI Rules and GSI Procedures have been correctly implemented by the software.

The software systems covered by this section of the review are:

- The Gas Bulletin Board (GBB)
- The GSI Fee Calculation Tool.

12.1.1 Certification of the GBB

The initial version of the GBB was certified in June 2013, prior to the official start of GBB operations on 1 August 2013. Since that time, a number of minor changes have been made to the GBB systems, none of which, in the IMO's or AEMO's opinion, required certifying under rule 19.

19 Certifying GBB software

(1) Subject to this rule, AEMO must ensure that any version of the GBB software used by AEMO has been certified as compliant with the Rules and Procedures by an independent auditor.

(2) AEMO may implement changes to the current version of the GBB software without obtaining certification under subrule (1) where AEMO considers that the change will not have a material impact on any one or more of the following:

(a) the provision of information to AEMO by Gas Market Participants under the Rules;

(b) the processing and publication of information on the GBB or the EMF; or

(c) the calculation and processing of GSI Invoices.

(3) Where AEMO considers that changes to the current version of the GBB software are urgently required and essential for the efficient operation of the GBB, AEMO may implement the changes to the current version of the GBB software prior to certification under subrule (1), and must obtain that certification as soon as practicable.

Details of production software changes made prior to this Audit Period are shown in Table 15. Releases with certification status of 'maintained' did not require additional testing, as they did not involve changes that would be expected to have material impact on prices or quantities.

Table 15: Previous production software changes

System	Version number	Release date	Material impact under 19(2)?	Certification status
GBB	1.0	01/08/2013	Yes	Certified
GBB	1.0.9	20/08/2013	No	Maintained
GBB	1.1.3	11/12/2013	No	Maintained
GBB	1.1.4	19/12/2013	No	Maintained
GBB	1.2.0	23/01/2014	No	Maintained
GBB	1.2.38	30/01/2014	No	Maintained
GBB	1.2-57.7	25/06/2014	No	Maintained
GBB	1.3-145	27/08/2014	No	Maintained
GBB	1.3-145-3	8/01/2015	No	Maintained
GBB	1.4-193	18/03/2015	No	Maintained
GBB	1.4-201	20/05/2015	No	Maintained
GBB	1.4-209-7	9/09/2015	No	Maintained
GBB	1.5-255-3	3/11/2015	No	Maintained

System	Version number	Release date	Material impact under 19(2)?	Certification status
GBB	1.6-289-4	29/11/2015	No	Maintained
GBB	1.6-289-7	30/03/2016	No	Maintained
GBB	1.7-303-6	21/06/2016	No	Maintained

For this audit, we reviewed the release notes for all changes made to the GBB during the Audit Period and assessed the changes in relation to rule 19(2) of the GSI Rules. In each case, we agreed with AEMO that certification was not required. The details of these changes are shown in Table 16.

Table 16: Changes to GBB systems in the Audit Period

System	Version number	Release date	Material impact under 19(2)?	Certification status	Comment
GBB	1.8-316-4	7/11/2016	No	Maintained	Updates to web user interface

12.1.2 Certification of the GSI Fee Calculation Tool

While the GSI Fee Calculation Tool is not specifically required to be certified under the GSI Rules, the calculation of GSI Fees is a part of this compliance audit.

There have been no changes to the GSI Fee Calculation Tool in the Audit Period, and none since the tool was certified in June 2016.

We have nevertheless reviewed the versions of the GSI Fee Calculation tool (used for the Q1 2017 fee calculations) to ensure the fee amounts are compliant with rule 116 of the GSI Rules.

During our review, we assumed the data extraction functionality was accurate; given there have been no changes to the tool since June 2016, this is a reasonable assumption. We have instead focussed on the unlocked components of the excel front-end.

Our review has indicated that the tool is compliant with GSI Rule 116. We have, however, noted that the tool calculates the quantity in rule 116(1) of the GSI Rules[3] assuming that unrecoverable amounts

[3] $F(p) = [Budget(y) + Regulator\ Fees(y)] \times \frac{days\ in\ p}{days\ in\ y} + U(p) - UR(p)$

(U(p)) and recovered unrecoverable amounts (UR(p)) are zero. In the event these quantities are non-zero, a manual adjustment must be made to the input quantities. However, this adjustment is covered in AEMO's work instructions. Therefore, the risk of non-compliance is negligible.

12.1.3 Compliance of GSI software with the GSI Rules

We have no audit findings to report with respect to the compliance of the GSI software with the GSI Rules.

12.2 General IT Controls (including software management)

General IT controls are also reviewed in the Electricity Compliance Audit. We carried out a single review covering both audits. For consistency, we report the same findings here using the same reference number, although we note that there may be references to functions or sites that are not part of AEMO's GSI function.

12.2.1 Audit activities

We reviewed AEMO's policies and procedures for:

- Business continuity
- Service management
- User-facing information security policies and procedures

We carried out compliance testing on:

- User password requirements
- Release notes
- Service management records (including AEMO Jira and ServiceNow incident, problem, change and release records)
- Data centre specifications;
- Application and system logs
- Backup schedule, and backup restoration tasks

12.2.2 Management of the GBB software

AEMO's obligations in this regard are specified in rule 18(1) of the GSI Rules.

> 18(1) Where AEMO uses software (GBB software) and IT systems (GBB systems) to receive, store, collate and publish information for the operation of the GBB, AEMO must:

(a) maintain a record of which version of GBB software was used at each point in time;

(b) where changes are made to GBB software, maintain records of the differences between each version and the reasons for the changes between versions;

(c) ensure that appropriate testing of new GBB software versions is conducted; and

(d) ensure that any version of the GBB software used by AEMO has been certified in accordance with rule 19.

The changes made to the GBB during the Audit Period are listed in the Table 16 in the previous section.

12.3 AUDIT FINDINGS

There have been no self-reported or other instances of non-compliance with rule 18(1) of the GSI Rules.

12.3.1 Compliance of software management processes with the GSI Rules

AEMO's software management processes for the GBB remain sufficient to comply with the GSI Rules.

Table 17: Comment on AEMO's compliance with rule 18(1) of the GSI Rules during the Audit Period

Clause	Comment on compliance
18(1)(a)	AEMO has maintained a record of all versions of market software used together with their dates in service, in the form of JIRA and ServiceNow records.
18(1) (b)	AEMO has maintained records of the differences between each version and the reasons for the differences, in the form of release notes and JIRA records.
18(1) (c)	AEMO has conducted appropriate testing of all new releases of the market software prior to their being placed in service.
18(1) (d)	AEMO has ensured that all software versions are covered by an independent certification prior to implementation where required.

12.3.2 General findings

Our findings associated with the review of AEMO's general IT controls is summarised below. Please note that these findings are also reported in the 2016/17 Electricity Compliance Audit Report and apply to the GSI Compliance Audit as well.

Table 18: Operational compliance findings associated with general IT controls

Ref	Issue Type	Risk & Compliance Ratings	Finding	Recommendation
17 WEM 2.39	(New issue)	Risk Rating Low Compliance Rating 2	The current backup regime and architecture is not documented. Regular backup testing does occur, with no more than six months elapsing between restoration tests. but coverage is unclear. AEMO has a project underway to refresh the backup infrastructure and regime in line with organisational standards.	Ensure that current backup refresh project delivers documentation for the architecture of the backup environment
17 WEM 2.40	(New issue)	Risk Rating Medium Compliance Rating 2	AEMO maintains redundant IT systems, so that the market can continue to operate in the event of losing one data centre. Both data centres are regularly exercised, by running production market systems from each location at regular intervals. While this is perhaps the most critical part of AEMO's business continuity preparation, other aspects of business continuity have not been explored. We have not seen evidence of any business continuity testing beyond system failover and backup restoration testing. This means that reliance on key people, office premises, physical equipment, and communications channels has not been tested. This applies to both CBD and EPCC activities, and is particularly concerning for control room operations.	Plan and conduct regular desk-based and live business continuity exercises covering selected credible contingency scenarios

Ref	Issue Type	Risk & Compliance Ratings	Finding	Recommendation
17 WEM 2.41	(New issue)	Risk Rating Low Compliance Rating 2	AEMO's Encryption Standard requires backup media to be encrypted where technically possible. AEMO WA backup media is not encrypted.	Consider backup media encryption as part of backup refresh project.
17 WEM 2.43	(New issue)	Risk Rating Low Compliance Rating 3	IT applications support and development has been insourced to new application support team. Team members are all new recruits, and are largely from a development background and relatively new to service management concepts. This increases the risk of problems in support processes.	Ensure support staff have appropriate service management training
17 WEM 2.44	(New issue)	Risk Rating Low Compliance Rating 3	AEMO CBD does have a configuration management database of sorts, but definitions used are inconsistent. Different people have used different concepts of what a "product" is, what a "configuration item" is, and which assets should be recorded and how. This significantly reduces the usefulness of a CMDB or CMS.	Ensure support staff have appropriate service management training Consider refreshing CMDB as part of the wider AEMO service management programme
17 WEM 2.45	(New issue)	Risk Rating Low Compliance Rating 2	Best practice for a critical infrastructure organisation like AEMO would be to have full, UTI Tier III, site level redundancy for critical systems, with sufficient geographic separation to avoid having both sites affected by the same incident. AEMO's IT infrastructure is located in two WA data centres. The newer facility is certified as UTI Tier III. The older facility does have redundancy on many levels, the facility is not certified as Tier III, and does not meet the Tier III requirements. The two facilities are 10.25km apart, both close to the centre of Perth.	Consider moving to a more distant Tier III aligned data centre site as part of next data centre lifecycle refresh project

13 APPENDIX – COMPLIANCE AND RISK RATINGS

This appendix contains information on the compliance and risk ratings used to classify audit findings.

13.1 COMPLIANCE AND RISK RATINGS

Audit findings are categorised as follows:

Table 19: Compliance ratings

Compliance rating	Description
1	Instances of non-compliance with the GSI Rules
2	Findings that are not an instance of non-compliance, but pose compliance risk
3	Findings related to minor housekeeping issues that do not affect compliance risk

Risk rating descriptors for audit findings were set in consultation with AEMO and are based on AEMO's corporate risk matrix (including definitions of impact and likelihood).

Table 20: Risk ratings

Risk rating	Description
Critical	Potential for catastrophic impact on market or system operations or other market outcomes if not addressed immediately. Requires executive actions and monitoring at board level.
Significant	Potential for major impact on market or system operations or other market outcomes if not addressed as a matter of priority. Requires senior management attention with regular monitoring at executive meetings.
Medium	Potential for moderate impact on market or system operations or other market outcomes if not addressed within a reasonable timeframe. Requires management attention with regular monitoring.
Low	Potential for minor impact on market or system operations or other market outcomes if not addressed in the future. Requires team level attention with regular monitoring.

AEMO's definitions of likelihood and consequence are provided in the sections below.

13.2 AEMO LIKELIHOOD RATINGS

Likelihood	Annual Probability	Qualitative Description
Almost Certain	>90%	Will occur in most circumstances; statistical record of several occurrences
Likely	51% - 90%	Can be expected to occur in most circumstances; statistical record of some occurrence
Possible	11% - 50%	May occur, but not expected in most circumstances; statistical record of at least one occurrence
Unlikely	1% - 10%	Conceivable but unlikely to occur in any given year; no history of occurrence
Rare	<1%	Will only occur in exceptional circumstances; no history of occurrence

13.3 AEMO IMPACT RATINGS

Type of impact	EXTREME	MAJOR	MODERATE	MINOR	IMMATERIAL
Reputation & Stakeholders	Significant long-term damage to stakeholder confidence and relationships; total loss of public confidence; intensive adverse media exposure	Significant short-term damage to stakeholder confidence and relationships; some loss of public confidence; adverse media exposure	Some damage to stakeholder confidence and relationships	Manageable reduction in stakeholder confidence	No lasting effects
AEMO Financial Impact	>$25M	>$5M-25M	>$500K-$5M	>$100K-$500K	<$100K
Safety	Single fatality or permanent injury or widespread impact on public safety	Serious injury requiring hospitalisation >5 days or localised impact on public safety	Injury requiring <5 days hospitalisation or medical treatment	Medical treatment only	First aid
Infrastructure, Assets & Environment	Permanent long-term effect and or rectification not possible	Significant effect, difficult rectification	Measurable effect, easy rectification	Measurable effect, no rectification required	No measurable damage or effect
Market	Loss of supply to >50% of customer demand in any one jurisdiction or >25% across multiple jurisdictions Market suspension in one jurisdiction or market	Loss of supply to >25% of customer demand in any one jurisdiction or >10% across multiple jurisdictions Market suspension in one jurisdiction or market	Loss of supply to >10% of customer demand in any one jurisdiction or >5% across multiple jurisdictions Market operating in an administered state for > 5 days for gas market or >1 day for electricity market	Loss of supply to >5% of customer demand in any one jurisdiction or >2% across multiple jurisdictions Market operating in an administered state for <5 days for gas market	No restriction of supply No disruption to markets

Type of impact	EXTREME	MAJOR	MODERATE	MINOR	IMMATERIAL
				or <1 day for electricity market	
Legal & Regulatory	Imprisonment or fine >$100 personal liability to officer or director of company Disqualification as officer/director Regulator or parliamentary inquiry with loss of market participants and public confidence	>$100K personal liability to officer or director Disqualification as officer/director Regulator or parliamentary inquiry with substantial loss of reputation, financial cost, loss of stakeholder confidence, political impact	Fine of less than $100K and no personal liability Regulator or government inquiry with loss of reputation or adverse government impact	Nominal fine Regulator or government inquiry resolved by routine management procedures	No fine No government or regulator inquiry