

Annual report to the Minister for Energy on AEMO's compliance

For the period to 28 February 2017

Economic Regulation Authority

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1 Introduction

Since 1 July 2016 the Economic Regulation Authority (**Authority**) has been responsible for the compliance and enforcement functions in the Wholesale Electricity Market (**WEM**) Rules and the Gas Services Information (**GSI**) Rules. Prior to this the Independent Market Operator (**IMO**) was responsible for these functions.

As part of its compliance and enforcement functions, the Authority is required by clause 2.14.5B of the WEM Rules to annually prepare a report to the Minister for Energy on the Australian Energy Market Operator's (**AEMO**) compliance with the WEM Rules and Market Procedures. The report must contain:

- (a) the Market Auditor's¹ reports regarding WEM Rule compliance audits of AEMO carried out during the relevant period;
- (b) any reports prepared and published by AEMO in response to the Market Auditor's reports referred to in (a); and
- (c) the results of any investigations of AEMO's compliance with the WEM Rules and the Market Procedures carried out by the Authority.

Rule 174(5) of the GSI Rules also requires the Authority to provide to the Minister:

- (a) the auditor's² reports regarding GSI Rule compliance audits of AEMO carried out during the relevant period; and
- (b) any reports prepared and published by AEMO in response to the auditor's reports referred to in (a).

The transitional provisions in the WEM Rules and the GSI Rules dealing with the transfer of electricity market operations and gas functions from the IMO to AEMO and the transfer of System Management functions from Wester Power to AEMO also require the compliance audits referred to above (for the 2015-2016 audit period) to cover the periods prior to the transfer of these functions as described later in this report³.

The remainder of this report sets out the information required to be provided to the Minister under the WEM Rules and the GSI Rules. This report covers the audit period from 1 August 2015 to 30 June 2016 and also includes investigations carried out by the Authority for the period from 1 July 2016 to 28 February 2017.

¹ Under clause 2.14.1 of the WEM Rules the Market Auditor is appointed by AEMO. For this reporting period the appointed auditor was PA Consulting Group. PA Consulting Group has been the appointed Market Auditor since the market commenced in 2006.

² Under rule 174(1) of the GSI Rules the auditor is appointed by AEMO. For this reporting period the appointed auditor was PA Consulting Group. PA Consulting Group has been the appointed auditor since the GSI Rules commenced in 2013.

³ See clause 1.14.7(b) and 1.16.4(b) of the WEM Rules and rule 4(b), Part 2, Division 2, Schedule 3 of the GSI Rules.

2 Audit Reports

2.1 WEM Audit Reports

The WEM Rules⁴ require AEMO to ensure that the Market Auditor carries out the following audits:

- (a) the compliance of AEMO's internal procedures and business processes with the WEM Rules;
- (b) AEMO's compliance with the WEM Rules and Market Procedures; and
- (c) AEMO's market software systems and processes for software management.

The transitional provisions in the WEM Rules also require AEMO (in relation to the 2015-2016 audit period) to ensure that the Market Auditor audits:

- (a) the IMO in respect of the IMO's activities prior to the AEMO Transition Date⁵; and
- (b) Western Power in respect of its compliance with the WEM Rules and Market Procedures in its former capacity as System Management prior to the System Management Transition Date⁶.

The Market Auditor has prepared three separate audit reports covering the above matters for the period from 1 August 2015 to 30 June 2016. These reports were published on 25 January 2017. In reporting its findings, the Market Auditor addressed AEMO's WEM Rule compliance, but also identified matters that pose compliance risk (but which are not considered by the Market Auditor to amount to non-compliance with the WEM Rules).

The Market Auditor applies the following ratings to non-compliance events, which are based on AEMO's corporate risk matrix:

- Critical: Potential for catastrophic impact on dispatch, settlement or other market outcomes if not addressed immediately. Requires executive actions and monitoring at board level.
- Significant: Potential for major impact on dispatch, settlement 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 dispatch, settlement or other market outcomes if not addressed within a reasonable timeframe. Requires management attention with regular monitoring.

⁴ See clause 2.14.3 of the WEM Rules.

⁵ See clause 1.14.7(b) of the WEM Rules. AEMO Transition Date means 8:00 AM on 30 November 2015. This is the date that electricity functions (including market operations functions) transferred from the IMO to AEMO.

⁶ See clause 1.16.4(b) of the WEM Rules. System Management Transition Date means 8:00 AM on 1 July 2016. This is the date that system operations functions transferred from Western Power to AEMO.

- Low: Potential for minor impact on dispatch, settlement or other market outcomes if not addressed in the future. Requires team level attention with regular monitoring.

As required by clause 2.14.5B(a) of the WEM Rules, the three audit reports are attached in the appendices to this report as follows:

Appendix 1 - Independent Assurance Report: Compliance of AEMO's internal procedures and business processes with the Wholesale Electricity Market Rules and AEMO's compliance with the Wholesale Electricity Market Rules and Market Procedures

This report identified a total of 18 instances of non-compliance with the WEM Rules and Market Procedures. One of these matters had a medium risk rating, while the remaining 17 matters had low risk ratings.

The one matter rated as medium risk related to two incidents where there were errors in the calculation of reserve capacity payment amounts for Market Customers. This resulted in overpayments totalling \$150,000 to some Market Customers and corresponding underpayments to others. While the WEM Rules precluded these amounts from being recalculated, AEMO has since implemented controls to address the issue.

The remaining matters were all rated as low risk by the Market Auditor. The report noted that the majority of these matters were self-reported, with nine of the 18 matters relating to errors or oversights in manual processes. The report stated⁷:

“AEMO (and the IMO before it) continues to take rule compliance seriously, and has a robust suite of controls in place to manage compliance risk. The organisation is proactive in reporting and addressing compliance issues, and we have noted improvements in several areas since our last audit, both in response to our findings and elsewhere. Most non-compliance are minor, one off, and have been followed up by improvements to controls. Nevertheless, there are still areas of compliance risk...”

The following compliance risks⁸ were identified by the Market Auditor in the report:

1. The quality of meter data provided by the Metering Data Agent (**MDA**) is considered to be a settlement compliance risk. Meter data is used in settling the market and this risk relates to the quality and consistency of the data provided by the MDA. The report noted that solutions for these issues are outside AEMO's direct control, but also noted that AEMO is doing what it can to address these issues.
2. There were several instances of incomplete audit trails for prudential security handling and lodgement processes. The report noted that AEMO processes for the handling of security instruments did not follow the documented procedures in all cases, and also recommended internal record keeping be improved to ensure clear audit trails.

⁷ Page 6 of [Independent Assurance Report: Compliance of AEMO's internal procedures and business processes with the Wholesale Electricity Market Rules and AEMO's compliance with the Wholesale Electricity Market Rules and Market Procedures](#).

⁸ These are matters that are not breaches of the WEM Rules, but are issues that are considered by the Market Auditor to pose a compliance risk.

3. There was a slight increase in incidents concerning information confidentiality. The report noted that AEMO has worked to increase the amount of 'self-service' for information requests. Requestors are encouraged to access publicly-available information from the AEMO website and participant-specific information from AEMO's market participant interface. The report described this as a good initiative that will reduce the likelihood of non-compliance. The report also noted that AEMO has initiated organisation-wide initiatives to raise awareness of these issues, has updated internal training modules, and is also investigating implementing additional controls to mitigate the risk of reoccurrence.
4. There is a need for procedure documentation for the new relationships (as of 1 July 2016) between the Market Operator, the System Operator and the Network Operator. The report recommended that AEMO monitor and report on progress in redeveloping these procedures.

Appendix 2 - Independent Assurance Report: Compliance of AEMO's software systems and processes for software management

There were no instances of non-compliance with the WEM Rules and Market Procedures identified in this report. However, the following risks, all rated as low, were noted in the report:

1. Current integration testing processes pose some risk of unanticipated change to business processes. The report noted that there were three instances where software releases introduced minor bugs or unexpected process changes. The report recommended that AEMO review its integration testing process.
2. There is an opportunity to improve the change and release processes for non-core market systems software. The report identified that there are tools that are external to the core market systems, but used in calculations, with potential to affect market outcomes. These tools are not subject to the same level of rigour for change and release management as the core market systems. The report recommended that these tools be brought into AEMO's normal change and release processes.

Appendix 3 - Independent Assurance Report: System Management's compliance with the Wholesale Electricity Market Rules and Market Procedures

This report identified a total of 23 instances of non-compliance with the WEM Rules and Market Procedures. One of these matters was considered to be of significant risk. The matter related to System Management dispatching a Facility out of merit as a result of an information technology issue that required System Management to use outdated information to dispatch Facilities (i.e. market participants can update their dispatch offers every two hours, but in this case the updated information could not be taken into account). The report noted that there was low market impact, as the information technology issue occurred when there is not much variation in dispatch offers (between 12:00 AM and 6:30 AM). It was noted that AEMO plans to undertake due diligence on System Management's market systems to better understand the level of risk.

Of the remaining 22 matters, 11 matters were considered to be of medium risk and the remainder low risk. The report noted that the majority of these matters were a result of errors or oversight in manual processes.

The following compliance risks were also noted in the report:

1. There is a significant risk to power system security and dispatch obligations due to the expected departure of experienced control room operators. The report noted that AEMO is in the process of recruiting new control room operators and developing a training plan for them. The report also noted that there are plans to extend existing contracts with control room operators to facilitate succession planning. Coinciding with this observation, the report also noted there is still no process documentation relating to control room operations (albeit some work has been done in this area although not yet formally approved).
2. The level of staffing in the control room continues to pose a risk to security and dispatch obligations. There is one controller on shift with two shifts per day. This practice is not consistent with the practice of comparable system operators internationally and has been highlighted in previous reports.
3. There have been repeat issues with the availability and performance of information technology systems resulting in multiple breaches of the Dispatch Criteria. The Market Auditor deemed this to be a significant audit finding but, as stated earlier, noted that AEMO plans to undertake due diligence on System Management's market systems to better understand the level of risk.
4. Governance of processes continues to pose a compliance risk in that process documentation is still lacking. The report referred to process documentation as being 'patchy or non-existent' except for the market operations area where the level of documentation is thorough. The report also noted that there is an opportunity to improve the level of audit trail for control room activities.
5. The timeliness and usefulness of Dispatch Advisories is a continuing concern. Dispatch Advisories provide information to market participants on issues affecting dispatch or affecting normal communications. The report noted that delays or failures in issuing Dispatch Advisories could compromise market transparency and affect efficient decision-making by participants.

2.2 GSI Audit Reports

The GSI Rules⁹ require AEMO to ensure that the audit covers the following matters:

- (a) the compliance of AEMO's internal procedures and business processes with the GSI Rules;
- (b) AEMO's compliance with the GSI Rules and GSI Procedures; and
- (c) AEMO's software systems for the Gas Bulletin Board and the calculation of GSI fees and processes for software management.

⁹ See rule 174(2) of the GSI Rules

The transitional provisions in the GSI Rules also require AEMO (in relation to the 2015-2016 audit period) to ensure that the auditor audits the IMO in respect of the IMO's activities prior to the AEMO Transition Date¹⁰.

The auditor has prepared a report covering the above matters for the period from 1 August 2015 to 30 June 2016. This report was published on 25 January 2017.

In similar fashion to the WEM audit reports, the auditor addressed AEMO's GSI Rule compliance, but also identified matters that pose compliance risk (but which are not considered by the auditor to amount to non-compliance with the GSI Rules). As required by rule 174(5) of the GSI Rules, the audit report is attached in the appendices to this report as follows:

Appendix 4 – Independent Assurance Report: AEMO's compliance with the Gas Services Information Rules

This report identified only one instance of non-compliance with the GSI Rules relating to the incorrect publication of Gas Bulletin Board data, with the auditor rating the non-compliance event as a low risk. The report stated¹¹:

“AEMO (and the IMO before it) continues to take rule compliance seriously, and has a robust suite of controls in place to manage compliance risk. The organisation is proactive in reporting and addressing compliance issues.”

In terms of compliance risks, some issues were noted relating to the currency of AEMO's internal procedures, as certain procedures still reflect the processes that were required prior to the AEMO Transition Date.

2.3 AEMO's response to the Audits

Clause 2.14.4(b) of the WEM Rules and rule 174(3) of the GSI Rules provides that AEMO, if it does not accept the audit reports and recommendations, must prepare a separate report setting out the matters that AEMO accepts and those that it does not accept, and setting out AEMO's reasons.

As required by clause 2.14.5B(a) of the WEM Rules and rule 174(5) of the GSI Rules, AEMO's report is provided in the appendices to this report as follows:

Appendix 5 – AEMO's Response to Market Auditor's Reports

In its response to the Market Auditor's reports, AEMO confirmed that it accepted all of the Market Auditor's findings and recommendations except for one finding and recommendation against System Management. Details of this finding and AEMO's response are set out in Table 1 below.

¹⁰ See rule 4(b), Part 2, Division 2, Schedule 3 of the GSI Rules. AEMO Transition Date means 8:00 AM on 30 November 2015. This is the date that gas functions transferred from the IMO to AEMO.

¹¹ Page 6 of [Independent Assurance Report: AEMO's compliance with the Gas Services Information Rules](#).

Table 1: Audit finding and recommendation not accepted – AEMO’s response¹²

Market Auditor Finding	AEMO Response
<p>System Management has no process to determine whether a participant has lodged an outage request to avoid exposure to paying reserve capacity refunds (as required under clause 3.19.3A(c)).</p> <p>Under clause 3.19.3A(c) of the Electricity Rules, System Management must not approve an outage request made principally to avoid exposure to reserve capacity refunds. Since market start, System Management has had no process to make this determination. With AEMO adopting the system operator role, and in light of AEMO staff’s greater knowledge and understanding of the Reserve Capacity Mechanism, we recommend AEMO establish a process to meet its obligations under this clause.</p>	<p>AEMO does not accept the above finding and recommendation on the basis that:</p> <p>a) Clause 3.19.3A(c) of the WEM Rules states:</p> <p style="padding-left: 40px;"><i>In assessing whether to grant a request for Opportunistic Maintenance, System Management:</i></p> <p style="padding-left: 40px;">...</p> <p style="padding-left: 40px;">(c) <i>may decline to approve Opportunistic Maintenance for a Facility or item of equipment where it considers that the request has been made principally to avoid exposure to Reserve Capacity refunds as described in clause 4.26 rather than to perform maintenance ...</i></p> <p>This clause states that AEMO <i>may</i> (rather than <i>must</i>) decline to approve of Opportunistic Maintenance made principally to avoid exposure to Reserve Capacity refunds.</p> <p>b) AEMO considers that under section 10.1 of the Facility Outage Power System Operating Procedure, there is a documented procedure permitting System Management to query requests for Opportunistic Maintenance by requiring the relevant Market Participant or Network Operator to make a written declaration that the capacity for which Opportunistic Maintenance is being sought is available prior to the outage commencing. If a Market Participant or Network Operator fails to comply with this request, then the PSOP requires System Management to reject the Opportunistic Maintenance request. In this context, the PSOP specifically refers to System Management’s discretion under clause 3.19.3A(c) of the WEM Rules, where it considers an outage request for Opportunistic Maintenance is made principally to avoid exposure to Reserve Capacity refunds.</p> <p>c) The WEM Rules do not confer any policing powers upon System Management to verify declared availability of Market Participants.</p>

The Authority will investigate the issue referred to in Table 1 in due course pursuant to the requirements of clause 2.13.10 of the WEM Rules and make its own determination on the matter.

¹² Page 4 of [AEMO’s Response to Market Auditor’s Reports](#).

3 Investigations by the Authority

3.1 WEM Investigations by the Authority

The Authority is required to include the results of any investigations it has carried out on AEMO's compliance with the WEM Rules and the Market Procedures in this report.

The Authority became responsible for compliance under the WEM Rules on 1 July 2016. Between 1 July 2016 and 28 February 2017, the Authority has completed four investigations of alleged breaches of the WEM Rules and/or Market Procedures by AEMO. All these matters were self-disclosed by AEMO. These matters are summarised in Table 2 below.

Table 2: Summary of AEMO investigations carried out during the period from 1 July 2016 to 28 February 2017

Investigation Reference	WEM Rule	Brief description	Investigation Outcome
INV-1 and INV-15 (AEMO 2016_01)	7.13.4	<p>The Operational System Load Estimate prepared by Western Power (in its previous capacity as System Management) on 8 January 2016 omitted data for two trading intervals. The Operational System Load Estimate is an estimate of the total consumption supplied via the SWIS during each interval for the preceding trading day. The estimate is an input into the LoadWatch Report which is published in the hot season and provides information to the market on the maximum and minimum temperatures, generation capacity and outages.</p> <p>Three estimates were provided on 8 January 2016. The first version was compliant with the WEM Rules and delivered by the required deadline. The second version which excluded the two intervals was not required and in any event was corrected by a third version. There were no material impacts to market processes.</p>	No breach found
INV-2 (AEMO 4)	3.17.2	<p>AEMO failed to publish the Short Term Projected Assessment of System Adequacy (ST PASA) study on 28 January 2016 on the Market Web Site as soon as practicable as was required under the WEM Rules pre 1 July 2016. The ST PASA study is a forecasting study produced weekly for the forward looking three week period detailing the system adequacy and generation requirements over the relevant period. Market Participants may use this information for determining the best times to request generator outages.</p> <p>In this case there was a five Business Day delay in publishing the ST PASA study. There were no material impacts to the market.</p>	Breach found

Investigation Reference	WEM Rule	Brief description	Investigation Outcome
INV-4 (AEMO 26)	9.19.1(b)	<p>AEMO failed to publish the adjusted Non-STEM Settlement Statements for March 2015, June 2015 and September 2015 by the due date of 15 March 2016.</p> <p>An adjusted Non-STEM Settlement Statement sets out adjustments to previous settlement periods required as a result of notices of disagreement, revisions to metering data and other triggers.</p> <p>In this case the statement was required to be published on 15 March 2016 but was not published until 19 March 2016. There was no evidence of any material impacts to market participants.</p>	Breach found
INV-24 and INV-78 (AEMO 24)	3.5.2 of the Market Procedure for Prudential Administration	<p>On 16 February 2016, AEMO inadvertently refunded a \$40,700 cash deposit for Credit Support back to a Market Participant, while transferring to that Market Participant other authorised amounts.</p> <p>The Market Procedure requires a written request prior to the return of Credit Support funds. No written request existed. The Market Participant was entitled to request return of the Credit Support amount at the time the funds were returned so there were no market impacts.</p>	Breach found

3.2 GSI Investigations by the Authority

While the GSI Rules do not require this report to include the results of any investigations carried out by the Authority on AEMO's compliance with the GSI Rules and GSI Procedures, this section has been included in this report for completeness.

To date the Authority has not investigated any alleged breaches of the GSI Rules or GSI Procedures by AEMO.

4 Conclusions

The Authority considers that most findings of non-compliance by AEMO in the audit reports and the matters investigated by the Authority were minor matters which had limited impact to the market. The majority of matters were self-reported by AEMO, and most of them were addressed at the time of the incident and/or mitigating actions were implemented shortly thereafter.

The Authority agrees with the Market Auditor's positive comments on AEMO's compliance management practices and considers that these comments accurately reflect AEMO's approach to meeting its compliance obligations under the WEM Rules and the GSI Rules.

The Market Auditor identified certain re-occurring compliance issues relating to System Management. The Authority notes that during the audit period AEMO became responsible for System Management functions. The Authority understands that AEMO intends to review the issues identified by the Market Auditor now that it has responsibility for the System Management function.

The Authority recommends that, in undertaking its review of the System Management issues, AEMO give priority to the significant risks identified in the audit reports, including the expected departure of experienced control room operators and the repeat issues concerning the availability and performance of information technology systems that have resulted in multiple breaches of the Dispatch Criteria. The Authority will monitor AEMO's progress with these issues.

**Appendix 1 – Independent Assurance Report:
Compliance of AEMO’s internal procedures and business
processes with the Wholesale Electricity Market Rules
and AEMO’s compliance with the Wholesale Electricity
Market Rules and Market Procedures**



AUSTRALIAN ENERGY MARKET OPERATOR

Independent Assurance Report:
Compliance of AEMO's internal
procedures and business processes with
the Wholesale Electricity Market Rules and
AEMO's compliance with the Wholesale
Electricity Market Rules and Market
Procedures

FINAL REPORT

9 December 2016



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FINAL

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FOREWORD

PA Consulting Group undertakes the Western Australian (WA) operational market audits which include:

- An Electricity Compliance Audit of the market operator¹ (*Audit 1*)
- An Electricity Software Compliance Audit of the market operator (*Audit 2*)
- A Gas Compliance Audit of the market operator² (*Audit 3*)
- An Electricity Compliance Audit of the system operator³ (*Audit 4*).

This independent assurance report pertains to Audit 1 above and is part of a series of four audit reports. The reports in this series are:

- *Audit 1: Independent Assurance Report: Compliance of AEMO's internal procedures and business processes with the Wholesale Electricity Market Rules and AEMO's compliance with the Wholesale Electricity Market Rules and Market Procedures*
- *Audit 2: Independent Assurance Report: Compliance of AEMO's software systems and processes for software management*
- *Audit 3: Independent Assurance Report: AEMO's compliance with the Gas Services Information Rules*
- *Audit 4: Independent Assurance Report: System Management's compliance with the Wholesale Electricity Market Rules and Market Procedures*

¹ Australian Energy Market Operator (AEMO) from the AEMO Transition Date as defined in the Electricity Rules (8AM, November 30th 2015); Independent Market Operator (IMO) prior to the AEMO Transition Date.

² Australian Energy Market Operator (AEMO) from the AEMO Transition Date as defined in the Gas Rules (8AM, November 30th 2015); Independent Market Operator (IMO) prior to the AEMO Transition Date.

³ Australian Energy Market Operator (AEMO) from the System Management Transition Date as defined in the Electricity Rules (8AM, 1 July 2016); Western Power (System Management) (SM), prior to the System Management Transition Date.

EXECUTIVE SUMMARY

This independent assurance report sets out the results of the market audit by PA Consulting Group assessing the compliance of AEMO's internal procedures and business processes with the Wholesale Electricity Market Rules (Electricity Rules) and AEMO's compliance with the Electricity Rules and Market Procedures (Electricity Procedures).

Regulatory context and scope

The audit of AEMO's market operations compliance (referred to as Audit 1) is conducted under clause 2.14.3 of the Electricity Rules, supplemented by transitional clause 1.14.7 which requires AEMO to ensure that for the first Market Audit following the AEMO Transition Date⁴, the Market Auditor audits both AEMO (for activities on and from the transition date) and the IMO (in respect of its activities before the transition date).

See Section 1.1 for further details on regulatory context.

Audit Period

The Audit Year is 1 August 2015 to 30 June 2016, both dates inclusive.

Audited Entity

For avoidance of doubt, the Audited Entity for this audit is:

- The Independent Market Operator of Western Australia (IMO) prior to the AEMO Transition Date
- AEMO following the AEMO Transition Date.

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 Audited Entity's Internal Procedures with the Electricity Rules
- We provide limited assurance under this standard with respect to our review of the Audited Entity's compliance with the Electricity Rules and Electricity Procedures.

Risk ratings and materiality

Risk ratings

Audit findings are categorised as follows:

⁴ 30 November 2015

Table 1: Compliance Ratings for Audit Findings

Compliance rating	Description
1	Instances of non-compliance with Electricity Rules and Electricity Procedures noted in audit
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).

Table 2: Risk Ratings for Audit Findings

Risk rating	Description
Critical 	Potential for catastrophic impact on dispatch, settlement or other market outcomes if not addressed immediately. Requires executive actions and monitoring at board level.
Significant 	Potential for major impact on dispatch, settlement 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 dispatch, settlement or other market outcomes if not addressed within a reasonable timeframe. Requires management attention with regular monitoring.
Low 	Potential for minor impact on dispatch, settlement or other market outcomes if not addressed in the future. Requires team level attention with regular monitoring.

Table 3: Risk rating matrix

		Consequence of risks associated with finding				
		Immaterial	Minor	Moderate	Major	Extreme
Likelihood of risk manifesting if finding not addressed	Almost Certain	Medium	Medium	Significant	Critical	Critical
	Likely	Low	Medium	Significant	Critical	Critical
	Possible	Low	Medium	Significant	Significant	Critical
	Unlikely	Low	Low	Medium	Medium	Significant
	Rare	Low	Low	Medium	Medium	Significant

Qualification of audit opinion

In determining whether to qualify our opinion on whether AEMO and IMO have 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 participants
- The number of 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).

Audit activities

We have undertaken a combination of reviews of self-reported incidents of non-compliance, compliance auditing and business process walkthroughs.

Our audit activities were focussed on subset of functional areas based on residual compliance risk, materiality and rule changes occurring in the audit period. These areas include:

- Capacity certification and bilateral capacity trades
- Settlements process (including meter data)
- Disputes and disagreements
- Handling of prudential security
- Relevant demand process (including assessment and approval of maintenance applications)
- Non-temperature dependent load assessment
- Monthly IRCR allocation, validation and monitoring
- Monitoring of market participants in support of IMO/ERA
- Constrained payment recovery
- Market fees (including payment to IMO/ERA).

While the transition of functions to AEMO affected a large number of obligations, and gave the AEMO a slightly reduced set of functions (as compared to the IMO prior to transition date), the only substantive change affecting the performance of market functions was the June 2016 amendments to the treatment of Demand Side Programmes in the reserve capacity mechanism.

We conducted one field-visit in September 2016 to interview AEMO staff and to conduct the business process walkthroughs.

Findings and recommendations

Summary of audit findings

Table 4 summarises audit findings by compliance and risk rating.

- 15 of the 18 Compliance Rating 1 findings for the audit period were self-reported.
- Nine of the Compliance Rating 1 findings related to errors or oversights in a manual process. In most cases these are not in the same areas as the past, and were followed up with changes to reduce the risk of recurrence.
- Three findings relate to technical breaches, where the most appropriate solution is a rule amendment.
- Three findings relate to software releases which introduced an error or an unanticipated business process change. All have been addressed, and process steps added to take a belt-and-braces approach in future.

Subsequent sections of this report provide a detailed explanation of each finding on rule chapter by chapter basis.

Table 4: Summary of audit findings classified by compliance and risk ratings

Risk rating	Compliance rating		
	1	2	3
	No findings	No findings	No findings
	No findings	No findings	No findings
	1	4	No findings
	17	6	1

Table 5 breaks down the audit findings further by chapter of the Electricity Rules. Subsequent sections of this report provide a detailed explanation of each finding on rule chapter by chapter basis.

Table 5: Summary of audit findings broken by chapter of Electricity Rules

Chapter	Compliance rating		
	1	2	3
2: Administration	 5	 2  1	No findings

Chapter	Compliance rating		
	1	2	3
3: Power System Security and Reliability	 1	 2	No findings
4: Reserve Capacity Rules	 1  4	 2	No findings
6: The Energy Market	 3	No findings	 1
9: Settlement	 3	 1  1	No findings
10: Market Information	 1	 1	No findings

Key findings

AEMO (and the IMO before it) continues to take rule compliance seriously, and has a robust suite of controls in place to manage compliance risk. The organisation is proactive in reporting and addressing compliance issues, and we have noted improvements in several areas since our last audit, both in response to our findings and elsewhere. Most non-compliances are minor, one off, and have been followed up by improvements to controls. Nevertheless, there are still areas of compliance risk, as discussed below.

Quality of meter data provided by MDA poses settlement compliance risk

The quality of meter data provided to AEMO by the Meter Data Agent remains a challenge. There are issues with the quality and consistency of data provided for use in settlement system, both in terms of standing data (loss factors, participant allocation, and dates), and meter readings.

These issues make it more difficult for AEMO personnel to identify problems with settlement data, increasing the likelihood of non-compliance incidents in this area – three of our findings relate to meter data issues – with moderate impact on settlement outcomes, some of which cannot be corrected in settlement adjustments.

While much of the solution lies outside AEMO's direct control, the organisation is doing what it can to address the situation, including a special project team tasked with investigating and remediating systemic issues in the meter data process. We were pleased to note the effort and quality of AEMO's validation and verification efforts for meter data specifically, and for settlement processes more generally.

We recommend that AEMO and Meter Data Agents put in place a clear interface contract for meter data provision (including standing data), though we recognise that this may only be possible as part of the transition of retail market functions from Western Power to AEMO. In any case, it is important to maintain the level of effort and focus given to validating and loading this critical market data.

Incomplete audit trail for prudential security handling and lodgement

While AEMO remains vigilant in its monitoring and management of credit limits, prudential security, and participant trading exposure, AEMO processes for the handling of security instruments have not followed the documented procedures in all cases.

Processes for release of security (be it credit support or reserve capacity security) have been tightened up during the audit period following the inadvertent release of credit support to a participant to whom reserve capacity security was being returned (the credit support was not required, so there was no risk to the market). Nevertheless, there remains room for improvement in the controls for handling credit support and reserve capacity security lodgements and returns.

We noted several instances where safe deposit box access documentation did not provide a full record of access and lodgement/withdrawal. We also note that reviews comparing the prudential register with the contents of the safe deposit boxes are intermittent (four occurrences since April 2015).

AEMO regularly monitors participant exposures and trading limits, so there is low likelihood of the market being affected by a participant default. However, internal record keeping should be improved to ensure there is a clear audit trail of lodgements and returns, access to deposited security, and comparison of lodgements against records, and internal procedures updated accordingly.

Confidentiality

After several years with reducing numbers of confidentiality incidents, we notice a small increase this year. Contributing factors include personnel changes, as well as the increasing use of analytics by market participants and the ongoing market reforms, which both increase the level of interest in market data.

AEMO has worked to increase the amount of 'self-service' for information requests, with requestors directed to the public data available on the website or to participant specific data via the market participant interface, and reducing the need to extract data using ad-hoc manual queries. This is a good initiative which will reduce the likelihood of non-compliance. We also note AEMO-wide initiatives to raise awareness of potential confidentiality issues, update internal training modules, and investigate additional technical controls to decrease likelihood of recurrence..

Procedure documentation and Market Operator – System Operator – Network Operator interfaces

The transfer of System Management functions to AEMO on 1 July included rule changes which removed explicit obligations for market operator and system operator to consult on various events, and to provide each other with data (replacing them instead with obligations to 'maintain' data, 'determine' quantities and similar).

We consider this an important compliance risk. Because of the lack of System Management internal procedure documentation, these rule changes increase the risk of data exchanges being missed, or decisions requiring both market operator and system operator input missing one or other.

It is critical that these newly internalised relationships be captured in well-designed, well-documented processes and procedures. Similarly, it is critical that newly externalised relationships between System Operator and Network Operator staff be documented and agreed.

We recommend that AEMO regularly track and report on progress redeveloping affected processes and procedures.

Opinion

Qualifications

The following qualifications apply to our opinion with respect to whether AEMO's internal procedures and business processes comply with the Electricity Rules in all material respects:

- AEMO's internal procedure 5.2 Determination of AEMO Budget has not been updated to reflect the 30 November transfer of IMO functions to AEMO, and if followed as written, would lead to non-compliance with chapter 2 of the Electricity Rules

Opinion with respect to the Audited Entity's compliance of procedures and business processes with the Electricity Rules

Our opinion is as follows.

Subject to the inherent limitations set out in Section 1.3.4 and the qualifications set out above, it is our opinion that AEMO's internal procedures and business processes comply with the Electricity Rules in all material respects.

Opinion with respect to the Audited Entity's compliance with the Electricity Rules and Electricity Procedures

Our opinion is as follows.

Subject to the inherent limitations set out in Section 1.3.4, 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 has not been compliant with the Electricity Rules and Market Procedures during the Audit Period, in all material respects.

Subject to the inherent limitations set out in Section 1.3.4, 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 the IMO has not been compliant with the Electricity Rules and Market Procedures during the Audit Period prior to 30 November 2015, in all material respects.

PA Consulting Group



A handwritten signature in black ink, appearing to read 'SJT', written over a light blue grid background.

Stephen James Thornton

Member of PA's Management Group

9 December 2016

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1 INTRODUCTION

This chapter sets out the regulatory context for Audit 1 and our approach to performing the audit.

1.1 Regulatory context and scope

The requirement for the audit of the AEMO is set out in the Wholesale Electricity Market Rules (the Electricity Rules).

Table 6 provides further detail on the heads of power that mandate this audit.

Table 6: Electricity Market Rules references pertaining to Market Audits

Clause reference	Comment
2.14.1	Requirement for AEMO to appoint market auditor
2.14.2	Requirement for AEMO to ensure market audits are undertaken no less than annually
2.14.3	Defines the scope of the Audit to include: <ul style="list-style-type: none">• The compliance of AEMO's internal procedures and business processes with the Electricity Rules• AEMO's compliance with the Electricity Rules and Market Procedures⁵• AEMO's market software systems and processes for software management⁶.
1.14.7 (Transitional)	Requires AEMO to ensure that for the first Market Audit following the AEMO Transition Date, the Market Auditor audits both AEMO (for activities on and from the transition date) and the IMO (in respect of its activities before the transition date)

This report covers our audit of AEMO and the IMO under 2.14.3(a) and (b). We report separately on our audit under 2.14.3(c) and on our audit of System Management functions.

At the time of the previous audit there were no obligations on AEMO, nor did AEMO have any documented procedures relating to the Electricity Rules. On 30 November 2015, most IMO functions and rule obligations were transferred to AEMO. The personnel implementing the obligations largely remained the same, as did the IT systems, operational processes, procedure documentation, and other controls. This means that from an operational perspective, there is continuity between the two organisations, and for this reason, where we refer to amendments or changes to AEMO obligations or AEMO procedures, we mean the differences between AEMO obligations or procedures and the equivalent IMO obligations or procedures as at the time of the previous audit.

1.2 Audited Entity

For avoidance of doubt, the Audited Entity for this audit is:

- The Independent Market Operator (IMO) prior to the AEMO Transition Date

⁵ Market Procedures defined in the Electricity Rules will be referred to from here-on as Electricity Procedures.

⁶ i.e. the compliance of the software with the calculations set out in the Electricity Rules, and the compliance of the software management processes with Clause 2.36.1 of the Electricity Rules.

- AEMO following the AEMO Transition Date.

1.3 Approach

1.3.1 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 Audited Entity's Internal Procedures with the Electricity Rules
- We provide limited assurance under this standard with respect to our review of the Audited Entity's compliance with the Electricity Rules and Market Procedures.

1.3.2 Risk ratings and materiality

Compliance and risk ratings

Audit findings are categorised as shown in Table 7.

Table 7: Compliance Ratings for Audit Findings

Compliance rating	Description
1	Instances of non-compliance with Electricity Rules and Electricity Procedures noted in audit.
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 ratings for audit findings were set in consultation with AEMO and are set out in Table 8.

Table 8: Risk ratings for Audit Findings

Risk rating	Description
Critical 	Potential for catastrophic impact on dispatch, settlement or other market outcomes if not addressed immediately. Requires executive actions and monitoring at board level.
Significant 	Potential for major impact on dispatch, settlement 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 dispatch, settlement or other market outcomes if not addressed within a reasonable timeframe. Requires management attention with regular monitoring.

Risk rating	Description
Low 	Potential for minor impact on dispatch, settlement or other market outcomes if not addressed in the future. Requires team level attention with regular monitoring.

Each finding has been categorised according to its impact and likelihood, using the matrix in Table 9, and AEMO's standard impact definitions shown in Table 10.

Table 9: Classification of Audit Findings

		Consequence of risks associated with finding				
		Immaterial	Minor	Moderate	Major	Extreme
Likelihood of risk manifesting if finding not addressed	Almost Certain	Medium	Medium	Significant	Critical	Critical
	Likely	Low	Medium	Significant	Critical	Critical
	Possible	Low	Medium	Significant	Significant	Critical
	Unlikely	Low	Low	Medium	Medium	Significant
	Rare	Low	Low	Medium	Medium	Significant

Table 10: 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 or <1 day for electricity market	No restriction of supply No disruption to markets
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

Qualification of audit opinion

In determining whether to qualify our opinion on whether AEMO and IMO have 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 participants
- The number of 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).

1.3.3 Audit activities

We have undertaken a combination of:

- Reviewing self-reported incidents of AEMO non-compliance with the Electricity Rules and Electricity 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.
- Compliance testing to audit AEMO’s operational compliance with the Electricity Rules and Electricity Procedures and to determine the effectiveness of operating controls. In doing so, we have sourced information from all the AEMO (WA) teams, with a particular emphasis on the market operations team.

The first two activities were conducted as part of a field-visit in September 2016. 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:

- Capacity certification and bilateral capacity trades
- Settlements process
- Disputes and disagreements
- Handling of prudential security
- Relevant demand process (including assessment and approval of maintenance applications)
- Non-temperature dependent load assessment
- Monthly IRCR allocation, validation and monitoring
- Monitoring of market participants in support of IMO/ERA
- Constrained payment recovery
- Market fees (including payment to IMO/ERA)

While the transition of functions to AEMO affected a large number of obligations, and gave the AEMO a slightly reduced set of functions (as compared to the IMO prior to transition date), the only substantive change affecting the performance of market functions was the June 2016 amendments to the treatment of Demand Side Programmes in the reserve capacity mechanism.

1.3.4 Inherent limitations and qualifications

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 electricity 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 Electricity Rules and Market Procedures are therefore subject to the following caveats:

1. 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, in the event that we were to detect any fraudulent or illegal activity, we would report this to AEMO. No such findings have been made during this audit.
2. 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. Specifically, our business process reviews assessing the use of controls were undertaken after the end of the audit period. As such:
 - a. Although our findings are indicative of AEMO’s practices during the audit period, they do not constitute definitive evidence that AEMO applied those controls during the audit period.
 - b. Projections of our findings to future periods carry the risk that:
 - i. Controls may become inadequate over time due to changes in the Electricity Rules or AEMO’s business processes, procedures and systems
 - ii. The degree of compliance with the control procedures we have reviewed deteriorates over time.
3. We have reviewed the governance of AEMO’s internal procedures, and are satisfied that the change management process described is robust. However, we have not tested the AEMO’s operational compliance against its procedure change management policies and have relied on the AEMO’s list of documented changes to internal procedures, including some which are still in draft status. Further, we have focused on changes relating to rule changes in the audit period, and sample checks of obligations that have not changed, and have not exhaustively reviewed all procedures against all rule obligations. Therefore, there is a minor risk that unauthorised changes may have been made to internal procedures that we have not reviewed.

1.4 Structure of this report

The remainder of this report is structured based on the chapters of the Electricity Rules and includes:

- A brief summary of rule chapter contents.
- Commentary on whether AEMO’s procedures (Electricity Procedures and Internal Procedures) have been updated to reflected amendments to the Electricity Rules during the Audit Year, and whether they comply with the Rules. Rule changes beyond the end of the Audit Year are not included.
- Commentary on AEMO’s operational compliance and areas of compliance risk (where relevant).

Unless otherwise specified, all references to the Electricity Rules refer to the most recently applicable rules as at the end of the Audit Year (i.e. the Electricity Rules as at 1 June 2016).

2 ELECTRICITY RULES CHAPTER 1 – INTRODUCTION

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

2.1 AEMO processes and procedures

2.1.1 Rule amendments

Most (but not all) of the obligations previously placed on the IMO under Chapter 1 have been transferred to AEMO. A new set of transitional obligations has also been introduced in relation to this transfer of functions.

2.1.2 Procedures

The following Market Procedures relating to Chapter 1 of the Electricity Rules were updated in the audit period.

ID	Title	Updated
MP 14	Notices and Communications	November 2015
MP 25	Web Site Changes	November 2015

The following Internal Procedures relating to Chapter 1 were updated in the audit period:

ID	Title	Updated
4.4.3	Publish to Web	December 2015

2.1.3 Compliance of AEMO's Procedures with Chapter 1 of the Electricity Rules

We have not noted any instances in which AEMO's Internal Procedures, if followed, would result in non-compliance with Chapter 1.

2.2 Compliance with Chapter 1

We have not conducted any audit procedures to assess AEMO's compliance with Chapter 1 of the Electricity Rules, except where the transitional provisions affect obligations elsewhere in the Rules.

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

3 ELECTRICITY RULES CHAPTER 2 – ADMINISTRATION

Chapter 2 of the Electricity Rules sets out obligations relating to Functions and Governance; Market Documents; Monitoring, Enforcement and Audit; Reviewable Decisions and Disputes; Market Consultation; Budgets and Fees; Maximum and Minimum Prices and Loss Factors; Participation and Registration; Communications and Systems Requirements; Prudential Requirements and Emergency Powers.

3.1 AEMO processes and procedures

3.1.1 Rule amendments

Many of the obligations previously placed on the IMO under Chapter 2 have been transferred to AEMO. Obligations not transferred to AEMO relate to:

- Operation of the Market Advisory Committee
- Rule making
- Monitoring and enforcement (AEMO retain an obligation to support IMO and ERA in their monitoring)

3.1.2 Procedures

The following Market Procedures relating to Chapter 2 of the Electricity Rules were updated in the audit period.

ID	Title	Updated
MP 3	Data and IT Interface Requirements	November 2015
MP 6	Determining Loss Factors	November 2015
MP 7	Facility Registration , De-Registration and Transfer Procedure	November 2015
MP 15	Procedure Administration	November 2015
MP 17	Prudential Requirements	November 2015
MP 18	Rule Participant Registration and De-Registration	November 2015

The following Internal Procedures relating to Chapter 2 have been updated since the last audit:

ID	Title	Updated
1.2	Compliance Monitoring and Enforcement	July 2016
1.4	Market Audits	June 2016
1.5	Disputes	June 2016
1.6	ERA Surveillance Meetings	July 2016
1.9	Synergy Daily Monitoring	July 2016
1.10	Compliance Weekly Reports	July 2016
2.1.1	Registration	August 2016

2.3.2	Prudential Requirements	September 2016
2.3.3	Settlement	August 2016
2.3.4	WEM Settlement Contingency	August 2016
2.4.1	Market Surveillance.doc	August 2016
4.2.2	Market Procedure Change	July 2016
5.1	Handling Guarantees and Bank Undertakings, and Security Deposits	August 2016
5.2	Determination of IMO Budget	August 2016
5.3	Fees	August 2016
IT3	Software Configuration Management Plan	September 2016

3.1.3 Compliance of AEMO's Procedures with Chapter 2 of the Electricity Rules

We have noted two instances in which AEMO's internal procedures, if followed, would result in non-compliance with Chapter 2:

- AEMO's internal procedure 5.2 Determination of AEMO Budget has not been updated to reflect the 30 November transfer of IMO functions to AEMO
- AEMO's internal procedure 5.3 Fees has not been updated to reflect the 1 July 2016 transfer of System Management Functions to AEMO

3.2 Compliance with Chapter 2

3.2.1 Audit Activities

We have undertaken compliance testing and business process walkthroughs in the following functional areas relating to Chapter 2 of the Electricity Rules:

- Processing of changes to Standing Data
- Settlements process
- Disputes and disagreements
- Handling of prudential security
- Monitoring of market participants in support of IMO and ERA
- Market fees

3.2.2 Audit Findings

Table 11 summarises audit findings by compliance rating and risk rating.

Table 12 provides details of audit findings that were classified as Compliance Rating 1 (i.e. incidents of non-compliance with Chapter 2 of the Electricity Rules).

Table 13 provides details of audit findings that were classified as Compliance Rating 2 and 3.

Table 11: Summary of audit findings classified by compliance and risk ratings

Risk rating	Compliance rating		
	1	2	3
		2	
	5	1	

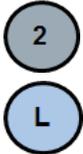
Table 12: Summary of Compliance Rating 1 Audit Findings (i.e. incidents of non-compliance with Chapter 2 of the Electricity Rules).

Electricity Rules clause	Risk Rating	Description
2.22.10		<p>Clause 2.22.10 requires AEMO to continue to apply the previous year’s market fees if the minister has not approved the IMO budget before the start of the Financial Year.</p> <p>AEMO has instead calculated market fees based on the proposed budget. This has been done in line with Clause 9.13.1, which requires AEMO to apply a market fee rate determined in accordance with 2.24.2, which states that if the Minister has not approved the IMO’s budget proposal, AEMO is to determine and publish the expected level of Market Fee rate for the IMO based on the most recent budget proposal.</p> <p>These clauses require AEMO to carry out two mutually exclusive actions, meaning there was no rule compliant action that AEMO could have taken in this case.</p> <p>In any case, once the budget is approved, any over- or under-recovery will flow through to the market fee calculation, so that over time, the right amount will be recovered.</p> <p>We recommend that AEMO propose a rule change to remove this contradiction.</p>
2.31.1(b)		<p>Clause 2.31.1 requires AEMO (and previously the IMO) to maintain various forms on the market web site, including a participant de-registration form under 2.31.1(b).</p> <p>From 1 July to 7 November 2015, the participant de-registration form was not available from the market web site.</p> <p>No participant sought de-registration in this period, and there is no evidence that any participant even looked for the form, as the one known deregistration enquiry in the period went directly to the IMO operations team.</p>
2.34.1(b)		<p>Until 30 June 2016, clause 2.34.1(b) required AEMO to provide revised Standing Data to System Management as soon as practicable.</p> <p>On one occasion during the audit period, AEMO did not notify System Management of updated standing data.</p> <p>AEMO generally consults with System Management on each standing data change before approving it. However, in the subset of change requests we reviewed, we found one occasion where AEMO had not provided explicit confirmation to System Management that the changed standing data had been approved.</p> <p>AEMO does provide updated standing data to System Management via an automated daily transfer, but this transfer does not include attachments provided by the market participant.</p> <p>In the specific case identified, there was no market impact. The update related to the availability period of a Demand Side Programme. This data was also available to System Management by another route, and in any case, no DSPs were dispatched in the audit period.</p> <p>We note that following our recommendation last year, the IMO undertook a process to ensure that the standing data records held by the market operator and system management matched each other, and has introduced a new process step to give approval confirmation to System Management, though this does not appear to have been executed in all cases.</p>

Electricity Rules clause	Risk Rating	Description
		This obligation was removed on 1 July 2016, as part of the transition of System Management functions to AEMO. In light of this change, we recommend that AEMO review and update internal procedures to ensure that AEMO uses consistent standing data for both market operations and for system management.
2.34.8		<p>Clause 2.34.8 requires AEMO to notify the Rule Participant of its acceptance or rejection of a requested change in Standing Data as soon as practicable, and no later than three Business Days after the request.</p> <p>On 6 August 2015, the IMO received a standing data change request, and did not approve until 12 August, 4 business days later. The issue was one of human error – dismissing an automated notification without taking the required action.</p> <p>The approval still came before the date at which the data was requested to take effect, and the request was subsequently withdrawn and resubmitted for other reasons.</p>
2.43.1		<p>Clause 2.43.1 requires AEMO to make and comply with a Market Procedure dealing with credit support processes. Clause 3.5.2 of the Prudential Requirements market procedure states that a participant must request any return of credit support in writing, and implicitly that AEMO must not release credit support without a written request from the participant.</p> <p>On 16 February 2016, AEMO returned credit support to a participant without being requested to do so. The credit support returned was in excess of the participant’s credit limit, so there was no market impact, and at all times AEMO held sufficient credit support.</p> <p>AEMO has now introduced additional controls around return of security, and we recommend that internal procedures are updated to reflect these new practices.</p>

Table 13: Summary of Compliance Rating 2 & 3 Audit Findings

Finding	Compliance & Risk Rating	Description
Process around handling of prudential security and reserve capacity security instruments allows room for human error	 	<p>While AEMO remains vigilant in its monitoring and management of credit limits, prudential security, and participant trading exposure, AEMO processes around the management and handling of prudential security have not followed the documented procedures in all cases.</p> <p>In the case of the unrequested return of credit support discussed in Table 12, the participant’s credit limit happened to be zero, so there was no additional risk to the market. If the issue were to recur, it could potentially cause a prudential obligation breach relating to the provision or holding of credit support. Processes for release of security have been tightened up considerably since, but there remains room for improvement in the controls for handling credit support and reserve capacity security.</p> <p>We noted several instances where safe deposit boxes had been accessed, but no completed access approval form could be sourced, or where instruments were both removed and deposited for the same participant, but only the deposits were noted on the form. We also note that new reserve capacity security provided by participants for the 2017/18 cycle in early September had not yet been lodged in the bank in mid-October – in part due to the time required for execution of security deeds – or shown on the prudential register. Finally, we note that reviews comparing the prudential register with the</p>

Finding	Compliance & Risk Rating	Description
		<p>contents of the safe deposit boxes were intermittent in 2015 (once in April and once in November), and the internal procedure on management of prudential security has not been updated to reflect the policy change from monthly to quarterly reviews of the boxes' contents.</p> <p>AEMO regularly monitors prudential exposures and trading limits, so there is low likelihood of the market being affected by a participant default. However, internal record keeping should be improved to ensure there is a clear audit trail of lodgements and returns, access to deposited security, and comparison of lodgements against records, and internal procedures updated accordingly.</p>
<p>Internal procedure 5.2 Determination of AEMO Budget has not been updated to reflect rule changes in the period</p>		<p>This internal procedure has not been updated to reflect the new rules around AEMO budgeting.</p> <p>The full set of new obligations has not yet been triggered, and we have not observed anything that suggests there has actually been an issue in this area, but correct procedure documentation is an important control for compliance risk. If the procedure were followed as written, AEMO would not comply with the rules.</p>
<p>Internal procedure 5.3 Fees has not been updated to reflect 1 July rule changes</p>		<p>This internal procedure has not been updated to reflect the new rules around setting and paying market fees, and in particular, still refers to a separate System Management budget that is to be approved by the Minister, and makes no mention of Market Fee payments to the IMO.</p> <p>The full set of new obligations has not yet been triggered, and we have not observed anything that suggests there has actually been an issue in this area, but correct procedure documentation is an important control for compliance risk. If the procedure were followed as written, AEMO would not comply with the rules.</p> <p>We understand that AEMO has drafted, but not yet approved, updates to this procedure.</p>

4 ELECTRICITY RULES CHAPTER 3 – POWER SYSTEM SECURITY AND RELIABILITY

Chapter 3 of the Electricity Rules sets out obligations relating to Power System Security and Reliability; Ancillary Services; Medium and Short Term Planning; Commissioning Tests; Decommithment and Reserve Capacity Obligations; and Settlement Data relating to power system operation.

4.1 AEMO processes and procedures

4.1.1 Rule amendments

AEMO only has a small number of obligations under chapter 3. Almost all of the obligations previously placed on the IMO under Chapter 2 have been transferred to AEMO. The only obligations not transferred to AEMO relate to carrying out the 5 yearly ancillary services review.

There have also been minor cosmetic amendments to Chapter 3 since last year's market audit, e.g. changes to clause wording to enhance clarity.

4.1.2 Procedures

There are no Market Procedures relating to Chapter 3 of the Electricity Rules.

The following Internal Procedures relating to Chapter 3 have been updated since the last audit:

ID	Title	Updated
1.12	Investigation of Incidents in the SWIS	June 2016
2.2.3	Daily Operations Procedure	August 2016
2.3.3	Settlement	August 2016
4.4.2	Processing System Management Reports	August 2016

4.1.3 Compliance of AEMO's Procedures with Chapter 3 of the Electricity Rules

We have noted two instances in which AEMO's Internal Procedures, if followed, would result in non-compliance with chapter 3:

- AEMO's internal procedure 4.1.5 Market Development Reviews has not been updated to reflect transfer of functions from IMO to AEMO
- AEMO's internal procedure 4.4.2 Processing System Management Reports has not been updated to reflect transfer of functions from SM to AEMO

4.2 Compliance with Chapter 3

4.2.1 Audit activities

We have not conducted any audit procedures to assess AEMO's compliance with Chapter 3 of the Electricity Rules.

There was one self-reported instance of non-compliance with Chapter 3.

4.2.2 Audit Findings

Table 14 summarises audit findings by compliance rating and risk rating.

Table 15 provides details of audit findings that were classified as Compliance Rating 1 (i.e. incidents of non-compliance with Chapter 3 of the Electricity Rules).

Table 16 provides details of audit findings that were classified as Compliance Rating 2 and 3.

Table 14: Summary of audit findings classified by compliance and risk ratings

Risk rating	Compliance rating		
	1	2	3
	1	2	

Table 15: Summary of Compliance Rating 1 Audit Findings (i.e. incidents of non-compliance with Chapter 3 of the Electricity Rules).

Electricity Rules clause	Risk Rating	Description
3.17.1		<p>Clause 3.17.2 of the Market Rules requires AEMO to publish the ST PASA on the market web site as soon as practicable after receiving it from System Management. The ST PASA Report for 28 January 2016 was not published until 4 February 2016.</p> <p>The report was received from System Management on 28 January, and AEMO attempted to publish it upon receipt. A technical issue with the website management software meant that the publication did not succeed, and the issue was not observed until 4 February. AEMO has now migrated to a new website management platform, and the publication process now includes a check that published material appears on the website.</p> <p>The issue was not material, as while there is excess capacity in the SWIS, the ST PASA reports are of limited interest to market participants, and are not critical in making market decisions.</p>

Table 16: Summary of Compliance Rating 2 & 3 Audit Findings

Finding	Compliance & Risk Rating	Description
AEMO's internal procedure 4.1.5 Market Development Reviews has not been updated to reflect transfer of functions from IMO to AEMO	 	<p>This internal procedure deals with AEMO obligations around a variety of market reviews required under the rules. It still references obligations that are now placed with IMO or ERA. It also does not reference AEMO's explicit obligations to assist with the ERA's review of Ancillary Service Standards and the basis for setting Ancillary Service Requirements.</p> <p>These reviews have been on hold with the EMR changes, and are not likely to run in the immediate future. Most of the procedure content is still valid for AEMO's role in supporting such reviews, but must be updated to reflect that AEMO does not take the lead role. The procedure as written does not reflect compliance with the Electricity Rules.</p>
AEMO's internal procedure 4.4.2 Processing System Management Reports has not been updated to reflect transfer of functions from SM to AEMO	 	<p>This internal procedure deals with AEMO obligations to publish information coming from System Management. With the 1 July 2016 transfer of System Management functions to AEMO, many of these obligations have been deleted, or altered to simply require AEMO (or AEMO in its role as SM) to publish the report or do something else with the data, such as the requirement to keep records of outage evaluations under 3.18.17 and 3.19.13.</p> <p>Although much of the process will remain relevant for this data, the procedure must be updated to reflect the new rules, or some of these obligations are likely to be missed.</p>

5 ELECTRICITY RULES CHAPTER 4 – RESERVE CAPACITY

Chapter 4 of the Electricity Rules sets out the Reserve Capacity Rules, including: Expressions of Interest; LT PASA; Certification of Capacity; Auctions and Bilateral Trades; Capacity Credits; Special Price Arrangements; Shortages of Reserve Capacity; Testing, Monitoring and Compliance; Funding; Capacity Refunds; Early Certification; and Settlement Data.

5.1 AEMO processes and procedures

5.1.1 Rule amendments

Most of the obligations previously placed on the IMO have been transferred to AEMO. Obligations not transferred to AEMO relate to:

- Reviewing the relevant planning criterion
- Reviewing the relevant level methodology
- Setting Benchmark Reserve Capacity Price methodology
- Reviewing the Benchmark Reserve Capacity Price methodology
- Managing Short Term Special Price arrangements

Substantive amendments to chapter 4 have changed the rules relating to allocation of reserve capacity to Demand Side Programmes, including AEMO's obligations in that area.

5.1.2 Procedures

The following Market Procedures relating to Chapter 4 of the Electricity Rules were updated in the audit period:

ID	Title	Updated
MP 1	Capacity Credit Allocation	November 2015
MP 2	Certification of Reserve Capacity	November 2015
MP 4	Declaration of Bilateral Trades and the Reserve Capacity Auction	November 2015
MP 8	Individual Reserve Capacity Requirements	November 2015
MP 10	Intermittent Load Refunds	November 2015
MP 19	Reserve Capacity Performance Monitoring	November 2015
MP 20	Reserve Capacity Security	November 2015
MP 21	Reserve Capacity Testing	November 2015
MP 24	Treatment of New Small Generators	November 2015
MP 27	Undertaking the LT PASA and undertaking a review of the Planning Criterion	November 2015
MP 29	Supplementary Reserve Capacity	November 2015

The following Internal Procedures relating to Chapter 4 have been updated since the last audit:

ID	Title	Updated
2.1.1	Registration	August 2016
2.2.5	IRCR & Reserve Capacity Allocation Monitoring	August 2016
2.3.3	Settlement	August 2016
3.1.1	Determination of the Benchmark Reserve Capacity Price	August 2016
3.1.2	LT PASA	August 2016
3.1.3	Preparation of the Statement of Opportunities Report	July 2016
3.1.4	Reserve Capacity Information Pack	August 2016
3.2.1	Calling and Processing EOIs for New Capacity	August 2016
3.2.2	Supplementary Reserve Capacity	August 2016
3.3.1	Certification of Facilities	September 2016
3.3.2	Applications for Accreditation for the Purposes of Certification of Reserve Capacity for Intermittent Generators	August 2016
3.4.1	Bilateral Trade Declarations	August 2016
3.4.2	Assignment of Capacity Credits	August 2016
3.4.4	Capacity Credits and Obligations	August 2016
3.4.5	Reserve Capacity Security	August 2016
3.6.1	Performance Monitoring	August 2016
3.6.2	Reserve Capacity Testing	August 2016
3.6.3	Progress Reports for construction of New Facilities	August 2016
3.6.4	Reduction of Capacity Credits Assigned to a Facility	August 2016
3.6.5	Relevant Demand Interval Determination and Maintenance Consumption Deviation Assessment	August 2016
3.8.1	Extension to Reserve Capacity Timetable	August 2016
5.1	Handling Guarantees and Bank Undertakings, and Security Deposits	August 2016
5.3	Fees	August 2016

5.1.3 Compliance of AEMO's Procedures with Chapter 4 of the Electricity Rules

We have noted two instances in which AEMO's Internal Procedures, if followed, would result in non-compliance with chapter 4:

- AEMO's internal procedure 3.3.1 *Certification of Facilities* does not implement decision and publication obligations relating to new rules for reducing capacity allocation for facilities exceeding permitted outage thresholds
- AEMO's internal procedure 4.1.5 *Market Development Reviews* has not been updated to reflect transfer of functions from IMO to AEMO

5.2 Compliance with Chapter 4

5.2.1 Audit Activities

We have undertaken compliance testing and business process walkthroughs in the following functional areas relating to Chapter 4 of the Electricity Rules:

- Capacity certification
- Handling of reserve capacity security
- Assessment of Non Temperature-Dependent Loads
- IRCR allocation, validation and monitoring

5.2.2 Audit Findings

Table 17 summarises audit findings by compliance rating and risk rating.

Table 18 provides details of audit findings that were classified as Compliance Rating 1 (i.e. incidents of non-compliance with Chapter 4 of the Electricity Rules).

Table 19 provides details of audit findings that were classified as Compliance Rating 2 and 3.

Table 17: Summary of audit findings classified by compliance and risk ratings

Risk rating	Compliance rating		
	1	2	3
	1		
	4	2	

Table 18: Summary of Compliance Rating 1 Audit Findings (i.e. incidents of non-compliance with Chapter 4 of the Electricity Rules).

Electricity Rules clause	Risk Rating	Description
4.5.3		<p>Clause 4.5.3 requires AEMO to notify Rule Participants of the information it requires from them in order to carry out the LT PASA, no later than 1 April.</p> <p>In past years, AEMO has sent notifications to all participants, even where information is not required. In 2016, due to an administrative oversight, AEMO did not send notifications to two participants.</p> <p>Both affected participants are very small, and neither have a registered scheduled generator. No information was required from these participants, so the oversight had no impact, other than potential confusion for the two participants.</p> <p>AEMO has updated internal procedures to clarify steps required to ensure all participants are contacted.</p>
4.27.1 (Multiple technical breaches)		<p>Clause 4.27.1 of the Electricity Rules requires AEMO to monitor the total availability of the SWIS on a daily basis. AEMO implements this rule on a monthly basis and is therefore in technical breach of this rule.</p> <p>This is a non-material technical breach identified in 2014.</p> <p>Clause 4.27.1 requires AEMO to monitor SWIS capacity on a daily basis so that they can implement clause 4.27.2 which requires AEMO to assess, on a monthly basis, the number of days in the preceding 12 months that SWIS capacity fell below particular thresholds as defined by this rule.</p> <p>AEMO implements both clauses 4.27.1 and 4.27.2 through a monthly system event. Hence, AEMO is in technical breach of clause 4.27.1 which requires them to implement the rule on a daily basis. We note this as a technical non-material breach as clause 4.27.1 is redundant; since AEMO only needs to monitor the available capacity on a monthly basis.</p>
4.28.7, 4.28.11 (Multiple breaches)		<p>Clause 9.3.2 requires Meter Data Agents (MDAs) to provide “settlement ready” metering data to the settlement system in accordance with Chapter 8. There is no definition of the term “settlement ready”.</p> <p>Clauses 4.28.7 and 4.28.11 require AEMO (and previously IMO) to determine Individual Reserve Capacity Requirements using the methodology in Appendix 5.</p> <p>Appendix 5, bullet 5 states that the meter registration data to be used in calculating Individual Reserve Capacity Requirements is to be the most current complete set of meter registration data as at the time of commencing the calculations.</p> <p>Two incidents led to IMO and AEMO not using the most current complete set of meter registration data when calculating Individual Reserve Capacity Requirements. Both issues were due to automatic validations on incoming meter standing data files, where AEMO’s (and previously the IMO’s) metering system rejected files where any single entry had inconsistencies:</p> <ol style="list-style-type: none"> 1. In the first case (from January to October 2015), the IMO did not load a standing data change which added a new channel for one meter, with the result that Meter Data Submissions for that channel were not used to determine Metered Schedules or IRCR calculations. The change was rejected as the file included a Distribution Loss Factor change where the effective date was prior to the effective date of the NMI.

Electricity Rules clause	Risk Rating	Description
		<p>2. In the second case (from April 2015 to February 2016), IMO and AEMO did not load a series of standing data changes relating to which participant was responsible for the consumption at a given meter. As a result, the metered volumes associated with 61 meters were allocated to the wrong participants in settlement and IRCR calculations.</p> <p>Prior to April 2015, IMO conducted a monthly reconciliation to resolve standing data differences between their metering system and the data provided by the MDA, but this process was discontinued for a period while the two parties worked to improve the underlying issues with the data provided for the monthly reconciliation. As a result, some standing meter data changes were not loaded into IMO's and AEMO's metering system.</p> <p>We therefore note that there are issues with the quality of standing data provided by the Meter Data Agent, with some updates having inconsistent data (such as the loss factor applying from a date earlier than the meter activation date, which may actually represent the date of latest change of owner rather than initial activation). In our view, this makes it considerably more difficult for AEMO to be sure it is using the latest meter data, but does not remove the obligation to do so.</p> <p>It is not clear that this is non-compliance by AEMO. If it is considered that the MDA has provided "settlement ready" metering data, then AEMO is directly non-compliant. If it is considered that the Meter Data Agent has failed to provide "settlement ready" metering data, then AEMO is either compliant, or any non-compliance is a consequence of the Meter Data Agent's non-compliance.</p> <p>AEMO and the MDA have now resolved the underlying issues with the data provided for the monthly reconciliation. From February 2016, AEMO has implemented a comprehensive daily manual cross-checking process, ensuring that all data changes are picked up promptly, and any changes to meter data will be addressed in settlement adjustments. We have reviewed this process, and are comfortable that AEMO's controls are as good as can be expected in the circumstances.</p> <p>IRCRs cannot be recalculated. Together, the two incidents resulted in around \$150,000 in IRCR overpayment to some participants, and a corresponding amount of underpayment to others.</p> <p>See related finding related to Clauses 9.3.3 arising from the same incidents.</p>
4.28.11, 4.1.28(b)		<p>Clause 4.28.11 requires AEMO to determine and publish an updated Individual Reserve Capacity Requirement for each Market Customer by the date and time specified in clause 4.1.28(b) (by 5:00 PM on the Business Day being five Business Days prior to the start of the relevant trading month).</p> <p>AEMO published the April 2016 IRCRs on 29 March 2016, instead of 23 March as required. AEMO published supporting material on 23 March (the IRCR Metering Report was published in WEMS and the IRCR Peak Intervals and Ratios on the market website), but human error led to the main Participant Information Report files not being published, and the issue was not observed until noted by a participant on 29 March. AEMO's publication process now includes a check that all files are visible to participants, supported by an automated notification.</p> <p>The issue was not material, as the information was published within hours of the participant inquiring.</p>
4.29.3(a)		<p>Clause 4.29.3 requires AEMO (and previously IMO) to provide data to the settlement system, including the applicable Monthly Reserve Capacity Price under 4.29.3(a).</p> <p>In November 2015, when carrying out the initial settlement run for October 2015 (the first month in the 2015-16 capacity year), the IMO provided the wrong Monthly Reserve Capacity Price to the settlement system for the first 30 days of the month.</p>

Electricity Rules clause	Risk Rating	Description
		<p>Monthly Reserve Capacity Price entry is a manual task, and in this case, the price was entered to take effect from 31 October instead of 1 October. As a result, the previous year's monthly price was applied for the first 30 days.</p> <p>The IMO subsequently updated internal procedures to clarify that the price should be entered to apply from the 1st of the month, and instituted a MOSMI alert to ensure the entry is carried out in the correct timeframe in future.</p> <p>Although the issue affected participant settlement amounts for that month by around \$10,000 in total, the error was corrected in the settlement adjustment carried out in April 2016.</p>

Table 19: Summary of Compliance Rating 2 & 3 Audit Findings

Finding	Compliance & Risk Rating	Description
AEMO's internal procedure 3.3.1 Certification of Facilities does not implement some of the 1 June 2016 rule changes	 	<p>This internal procedure has been updated to reflect the new reserve capacity rules, but does not implement decision and publication obligations relating to new rules for reducing capacity allocation for facilities exceeding permitted outage thresholds.</p> <p>We have not observed anything that suggests there has actually been an issue in this area, but correct procedure documentation is an important control for compliance risk. If the procedure were followed as written, AEMO would miss important publication requirements, and criteria for making the decision.</p> <p>We understand that AEMO will include these additions in the next version of the procedure.</p>
AEMO's internal procedure 4.1.5 Market Development Reviews has not been updated to reflect transfer of functions from IMO to AEMO	 	<p>This internal procedure deals with AEMO obligations around a variety of market reviews required under the rules. It still references obligations that are now placed with IMO or ERA. In particular, reviews of the Planning Criterion, the Relevant Level Methodology, and the Maximum Reserve Capacity Price.</p> <p>These reviews have been on hold with the EMR changes, and are not likely to run in the immediate future. Most of the procedure content is still valid for AEMO's role in supporting such reviews, but must be updated to reflect that AEMO does not take the lead role. The procedure as written does not reflect compliance with the Electricity Rules.</p>

6 ELECTRICITY RULES CHAPTER 5 – NETWORK CONTROL SERVICES

Chapter 5 of the Electricity Rules sets out obligations relating to Network Control Services, including the process, and settlement data requirements.

6.1 AEMO processes and procedures

6.1.1 Rule amendments

AEMO has only a handful of obligations under chapter 5. All obligations previously placed on the IMO under Chapter 5 have been transferred to AEMO.

6.1.2 Procedures

There are no Electricity Procedures associated with AEMO’s obligations under Chapter 5 of the Electricity Rules.

The following Internal Procedures relating to Chapter 4 have been updated since the last audit:

ID	Title	Updated
2.3.3	Settlement	August 2016

6.1.3 Compliance of AEMO’s Procedures with Chapter 5 of the Electricity Rules

We have not noted any instances in which AEMO’s Internal Procedures, if followed, would result in non-compliance with Chapter 5.

6.2 Compliance with Chapter 5

The AEMO has not used the provisions of chapter 5.

We have not conducted any audit procedures to assess AEMO’s compliance with Chapter 5.

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

7 ELECTRICITY RULES CHAPTER 6 – THE ENERGY MARKET

Chapter 6 of the Electricity Rules sets out obligations relating to the Energy Scheduling Timetable and Process; the Short Term Energy Market; Non-Balancing Dispatch Merit Orders; Balancing Prices and Quantities; Market Advisories and Energy Price Limits; and Settlement Data.

7.1 AEMO processes and procedures

7.1.1 Rule amendments

All the obligations previously placed on the IMO under Chapter 6 have been transferred to AEMO.

7.1.2 Procedures

There are no Market Procedures relating to Chapter 6 of the Electricity Rules.

The following Internal Procedures relating to Chapter 6 have been updated since the last audit:

ID	Title	Updated
1.2	Compliance Monitoring and Enforcement	July 2016
2.2.3	Daily Operations Procedure	August 2016
2.2.4	Operations Contingency Procedure	August 2016
2.2.6	STEM & Balancing Price Limits	July 2016
4.1.3	Energy Price Limits Review	December 2015

7.1.3 Compliance of AEMO's Procedures with Chapter 6 of the Electricity Rules

We have not noted any instances in which AEMO's Internal Procedures, if followed, would result in non-compliance with Chapter 6.

7.2 Compliance with Chapter 6

7.2.1 Audit Activities

We have undertaken compliance testing and business process walkthroughs in the following functional areas relating to Chapter 6 of the Electricity Rules:

- Daily operations processes
- Settlements process
- Market fees

7.2.2 Audit Findings

Table 20 summarises audit findings by compliance rating and risk rating.

Table 21 provides details of audit findings that were classified as Compliance Rating 1 (i.e. incidents of non-compliance with Chapter 6 of the Electricity Rules).

Table 22 provides details of audit findings that were classified as Compliance Rating 2 and 3.

Table 20: Summary of audit findings classified by compliance and risk ratings

Risk rating	Compliance rating		
	1	2	3
	3		1

Table 21: Summary of Compliance Rating 1 Audit Findings (i.e. incidents of non-compliance with Chapter 6 of the Electricity Rules).

Electricity Rules clause	Risk Rating	Description
6.3A.2(a)		<p>6.3A.2(a) requires AEMO to calculate the Maximum Supply Capability of each participant as specified.</p> <p>On 24 May 2016, AEMO used incorrect loss factors in calculating the Maximum Supply Capability for two participants. The issue was caused by a bug introduced in a metering software release, and affected two facilities with particular characteristics. The software was fixed and updated by 27 May 2016.</p> <p>The incorrect calculation meant that the participants were unable to submit STEM offers for their full capacity, but as neither participant had an offer cleared in the STEM, there was no market impact.</p>
6.20.3(b)		<p>6.20.3(b) requires AEMO (and previously IMO) to calculate the Alternative Maximum STEM Price (the offer cap for liquid fuelled facilities) as specified.</p> <p>From October 2014 to June 2016, the IMO did not calculate the Alternative Maximum STEM Price correctly. In particular, it did not incorporate the effect of CPI indexation of the fuel excise amount.</p> <p>In 6 of the 21 months, the resulting price was still correct, and the maximum error in any one month was \$4/MWh.</p> <p>While some facilities did offer into the market at the AMSP, no participant was ever cleared at this price, so the incorrect price never affected the market price. In the single instance where a participant was paid constrained payments based on the AMSP, and the total amount incorrectly paid was less than \$200.</p> <p>AEMO has since updated the calculation tool and associated documentation, including seeking and gaining independent certification that the calculations are correct.</p>
6.21.2(b)(i) 6.21.2(b)(ii)		<p>6.21.2(b)(i) and (ii) require AEMO (and previously IMO) to provide loss factor adjusted prices to the settlement system for use in calculating constrained on and off payments.</p> <p>For NSTEM settlement runs between 25 September 2015 and 31 January 2016, IMO and AEMO supplied non-loss adjusted prices to the settlement system for some facility offers.</p> <p>The issue was caused by a bug in a change to the WEMS-Settlement interface released in September 2015. It was fixed in February 2016.</p> <p>The only facilities impacted were those who submitted at the price cap or floor, and were issued constrained on or off payments. The issue affected only a small number of constrained payment calculations, with a total impact of approximately \$2,500, which will be adjusted in a later settlement adjustment, using the later version of the software in which the bug was corrected.</p> <p>AEMO has reviewed the potential for other errors of this sort to be introduced to the software, and has extended the automatic testing suite to include aspects of the WEMS-Settlement interface.</p>

Table 22: Summary of Compliance Rating 2 & 3 Audit Findings

Finding	Compliance & Risk Rating	Description
<p>Rule inconsistency in relation to settlement tolerances raises a risk of incorrect tolerances being used</p>	<p>3 L</p>	<p>System Management (now AEMO) can determine Facility Tolerance ranges for all facilities, but the rules only specify that settlement shall use those for Scheduled Generators, with others calculated according to a specific formula.</p> <p>System Management has determined a tolerance range for one of the wind farms (at the participant's request), but there is no provision in the rules to use this in determining the settlement tolerance. As it happens, the determined range is the same as would be calculated in its absence, so there is no effect. However, if in future a different tolerance range is determined for any non-scheduled generator, the correct treatment would be unclear.</p> <p>We recommend AEMO propose a rule change to address this issue.</p>

8 ELECTRICITY RULES CHAPTER 7 – DISPATCH

Chapter 7 of the Electricity Rules sets out obligations relating to the dispatch process, including: non-balancing dispatch; dispatch compliance; advisories, balancing suspension and reporting; and settlement and monitoring data relating to dispatch.

8.1 AEMO processes and procedures

8.1.1 Rule amendments

Almost all the obligations previously placed on the IMO under Chapter 7 have been transferred to AEMO. Obligations not transferred to AEMO relate to oversight of meetings between Synergy and System Management.

8.1.2 Procedures

There are no Market Procedures relating to Chapter 7 of the Electricity Rules.

The following Internal Procedures relating to Chapter 7 have been updated since the last audit:

ID	Title	Updated
2.2.3	Daily Operations Procedure	August 2016
2.2.4	Operations Contingency Procedure	August 2016
3.2.2	Supplementary Reserve Capacity	August 2016
4.4.2	Processing System Management Reports	August 2016

8.1.3 Compliance of AEMO's Procedures with Chapter 7 of the Electricity Rules

We have not noted any instances in which AEMO's Internal Procedures, if followed, would result in non-compliance with Chapter 7.

8.2 Compliance with Chapter 7

We have not conducted any audit procedures to assess AEMO's compliance with Chapter 7 of the Electricity Rules.

There have been no self-reported instances of non-compliance with Chapter 7.

9 ELECTRICITY RULES CHAPTER 7A – BALANCING MARKET

Chapter 7A of the Electricity Rules sets out obligations relating to the balancing market.

9.1 AEMO processes and procedures

9.1.1 Rule amendments

Almost all the obligations previously placed on the IMO under Chapter 2 have been transferred to AEMO. The only obligations not transferred to AEMO relates to the original setting of balancing market commencement day.

9.1.2 Procedures

The following Market Procedures relating to Chapter 7A of the Electricity Rules were updated in the audit period:

ID	Title	Updated
MP 30	Balancing Facility Requirements	November 2015
MP 31	Balancing Market Forecast	November 2015

The following Internal Procedures relating to Chapter 7A have been updated since the last audit:

ID	Title	Updated
1.2	Compliance Monitoring and Enforcement	July 2016
2.1.1	Registration	August 2016
2.2.3	Daily Operations Procedure	August 2016

9.1.3 Compliance of AEMO's Procedures with Chapter 7A of the Electricity Rules

We have not noted any instances in which AEMO's Internal Procedures, if followed, would result in non-compliance with Chapter 7A.

9.2 Compliance with Chapter 7A

9.2.1 Audit Activities

We have undertaken compliance testing and business process walkthroughs in the following functional areas relating to Chapter 7A of the Electricity Rules:

- Monitoring of market participants in support of IMO and ERA

9.2.2 Audit Findings

There are no findings relating to Chapter 7A.

There have been no self-reported instances of non-compliance with Chapter 7A.

10 ELECTRICITY RULES CHAPTER 7B – LOAD FOLLOWING SERVICE MARKET

Chapter 7B of the Electricity Rules sets out obligations relating to the load following service market.

10.1 AEMO processes and procedures

10.1.1 Rule amendments

All the obligations previously placed on the IMO under Chapter 7B have been transferred to AEMO.

10.1.2 Procedures

The following Market Procedures relating to Chapter 7B of the Electricity Rules were updated in the audit period:

ID	Title	Updated
MP 31	Balancing Market Forecast	November 2015

The following Internal Procedures relating to Chapter 7B have been updated since the last audit:

ID	Title	Updated
1.2	Compliance Monitoring and Enforcement	July 2016

10.1.3 Compliance of AEMO's Procedures with Chapter 7B of the Electricity Rules

We have not noted any instances in which AEMO's Internal Procedures, if followed, would result in non-compliance with Chapter 7B.

10.2 Compliance with Chapter 7B

10.2.1 Audit Activities

We have undertaken compliance testing and business process walkthroughs in the following functional areas relating to Chapter 7B of the Electricity Rules:

- Monitoring of market participants in support of IMO and ERA

10.2.2 Audit Findings

There are no findings relating to Chapter 7B.

There have been no self-reported instances of non-compliance with Chapter 7B.

11 ELECTRICITY RULES CHAPTER 8 – WHOLESALE MARKET METERING

Chapter 8 of the Electricity Rules sets out obligations relating to metering, including: Metering Data Agents; Meter Registry; Meter Data Submissions; Metering Protocol Requirements; and Support of Calculations.

11.1 AEMO processes and procedures

11.1.1 Rule amendments

AEMO has only a small number of obligations under Chapter 8. All the obligations previously placed on the IMO under Chapter 8 have been transferred to AEMO.

11.1.2 Procedures

The following Market Procedures relating to Chapter 8 of the Electricity Rules were updated in the audit period:

ID	Title	Updated
MP 12	Meter Data Submissions	November 2015

The following Internal Procedures relating to Chapter 8 have been updated since the last audit:

ID	Title	Updated
2.1.1	Registration	August 2016
2.3.3	Settlement	August 2016

11.1.3 Compliance of AEMO's Procedures with Chapter 8 of the Electricity Rules

We have not noted any instances in which AEMO's Internal Procedures, if followed, would result in non-compliance with Chapter 8.

11.2 Compliance with Chapter 8

11.2.1 Audit Activities

We have undertaken compliance testing and business process walkthroughs in the following functional areas relating to Chapter 8 of the Electricity Rules:

- Meter data validation
- Disputes and disagreements

11.2.2 Audit Findings

There are no findings relating to Chapter 8.

There have been no self-reported instances of non-compliance with Chapter 8.

12 ELECTRICITY RULES CHAPTER 9 – SETTLEMENT

Chapter 9 of the Electricity Rules sets out obligations relating to Settlement Data; Settlement Calculations; Settlement Statements; Invoicing and Payment; and Default and Settlement in Default Situations.

12.1 AEMO processes and procedures

12.1.1 Rule amendments

All the obligations previously placed on the IMO under Chapter 9 have been transferred to AEMO.

12.1.2 Procedures

The following Market Procedures relating to Chapter 9 of the Electricity Rules were updated in the audit period.

ID	Title	Updated
MP 1	Capacity Credit Allocation	November 2015
MP 17	Prudential Requirements	November 2015
MP 23	Settlement	November 2015

The following Internal Procedures relating to Chapter 9 have been updated since the last audit:

ID	Title	Updated
2.1.1	Registration	August 2016
2.2.5	IRCR & Reserve Capacity Allocation Monitoring	August 2016
2.3.1	WEM Meter Data Management	August 2016
2.3.3	Settlement	August 2016
2.3.4	WEM Settlement Contingency	August 2016
5.1	Handling Guarantees and Bank Undertakings, and Security Deposits	August 2016

12.1.3 Compliance of AEMO's Procedures with Chapter 9 of the Electricity Rules

We have noted one instance in which AEMO's internal procedures, if followed, would result in non-compliance with Chapter 9:

- AEMO's internal procedure 2.3.3 Settlement has not been updated to reflect the 1 July transfer of SM functions to AEMO in all cases

12.2 Compliance with Chapter 9

12.2.1 Audit Activities

We have undertaken compliance testing and business process walkthroughs in the following functional areas relating to Chapter 9 of the Electricity Rules:

- Meter data validation
- Disputes and disagreements
- Constrained payment recovery
- Settlements process
- Market fees

12.2.2 Audit Findings

Table 23 summarises audit findings by compliance rating and risk rating.

Table 24 provides details of audit findings that were classified as Compliance Rating 1 (i.e. incidents of non-compliance with Chapter 9 of the Electricity Rules).

Table 25 provides details of audit findings that were classified as Compliance Rating 2 and 3.

Table 23: Summary of audit findings classified by compliance and risk ratings

Risk rating	Compliance rating		
	1	2	3
		1	
	3	1	

Table 24: Summary of Compliance Rating 1 Audit Findings (i.e. incidents of non-compliance with Chapter 9 of the Electricity Rules).

Electricity Rules clause	Risk Rating	Description
<p>9.3.3 (Multiple breaches)</p>		<p>Clause 9.3.2 requires Meter Data Agents (MDAs) to provide “settlement ready” metering data to the settlement system in accordance with Chapter 8. There is no definition of the term “settlement ready”.</p> <p>Clause 9.3.3 requires AEMO to determine the Metered Schedule for various facilities in accordance with 9.3.4.</p> <p>Clause 9.3.4 states that where interval meter data is available, the Metered Schedule is to be determined from Meter Data Submissions received by AEMO.</p> <p>Two incidents led to IMO and AEMO not using the most current complete set of meter registration data when calculating Metered Schedules. Both issues were due to automatic validations on incoming meter standing data files, where AEMO’s (and previously the IMO’s) metering system rejected files where any single entry had inconsistencies:</p> <ol style="list-style-type: none"> 1. In the first case (from January to October 2015), the IMO did not load a standing data change which added a new channel for one meter, with the result that Meter Data Submissions for that channel were not used to determine Metered Schedules or IRCR calculations. The change was rejected as the file included a Distribution Loss Factor change where the effective date was prior to the effective date of the NMI. 2. In the second case (from April 2015 to February 2016), IMO and AEMO did not load a series of standing data changes relating to which participant was responsible for the consumption at a given meter. As a result, the metered volumes associated with 61 meters were allocated to the wrong participants in settlement and IRCR calculations. <p>Prior to April 2015, IMO conducted a monthly reconciliation to resolve standing data differences between their metering system and the data provided by the MDA, but this process was discontinued for a period while the two parties worked to improve the underlying issues. As a result, some valid data was not loaded into IMO’s and AEMO’s metering system.</p> <p>We therefore note that there are issues with the quality of standing data provided by the Meter Data Agent, with some updates having inconsistent data (such as the loss factor applying from a date earlier than the meter activation date, which may actually represent the date of latest change of owner rather than initial activation). In our view, this makes it considerably more difficult for AEMO to be sure it is using the latest meter data, but does not remove the obligation to do so.</p> <p>It is not clear that this is non-compliance by AEMO. If it is considered that the MDA has provided “settlement ready” metering data, then AEMO is directly non-compliant. If it is considered that the Meter Data Agent has failed to provide “settlement ready” metering data, then AEMO is either compliant, or any non-compliance is a consequence of the Meter Data Agent’s non-compliance.</p> <p>AEMO and the MDA have now resolved the underlying issues with the data provided for the monthly reconciliation. From February 2016, AEMO has implemented a comprehensive daily manual cross-checking process, ensuring that all data changes are picked up promptly, and any changes to meter data will be addressed in settlement adjustments. We have reviewed this process, and are comfortable that AEMO’s controls are as good as can be expected in the circumstances.</p> <p>Settlement errors, though significant, will be or will have been corrected in later settlement adjustments, so the risk rating is low.</p> <p>See related finding related to Clause 4.28.7 and 4.28.11 arising from the same incidents.</p>

Electricity Rules clause	Risk Rating	Description
9.4.7 (Multiple technical breaches)		<p>Clause 9.4.7 of the Electricity Rules requires AEMO to confirm receipt of a Capacity Credit Allocation Submission from a Market Participant (made under clause 9.4.6) by telephone within 30 minutes of receiving the submission. AEMO has automated the receipt of Capacity Credit Allocation Submissions in WEMS, and is therefore in technical breach of clause 9.4.7 (as it does not confirm receipt via telephone).</p> <p>This is a non-material technical breach identified in 2014. The IMO is complying with the intent of the rule (by automating confirmation receipts), and confirmation by telephone is unnecessary.</p>
9.19.1(b) (Two breaches)		<p>Clause 9.19.1(b) requires AEMO to provide adjusted STEM Settlement Statements and adjusted Non-STEM Settlement Statements to Rule Participants in accordance with the settlement timeline.</p> <ol style="list-style-type: none"> <li data-bbox="593 576 2074 815"> <p>The 2015-16 Settlement Cycle Timeline provides for adjusted Non-STEM Settlement Statements for March, June and September 2015 to be published by 15 March 2016. AEMO did not provide these statements until 19 March 2016.</p> <p>The late publication was due to a software change that had the effect of requiring an additional manual action to publish the statements.</p> <p>The late statements did not affect the publication of settlement invoices, which were published on time two days later.</p> <p>AEMO has since updated the software to remove the additional manual step.</p> <li data-bbox="593 839 2074 1031"> <p>The 2015-16 Settlement Cycle Timeline provides for adjusted Non-STEM Settlement Statements for June, September and December 2015 to be published by 15 June 2016. AEMO did not provide these statements until 16 June 2016.</p> <p>The late publication was due to human error, with the responsible settlement analyst dismissing an automated notification to publish the statements without taking the required action.</p> <p>Invoices were published on time on 17 June, and settlement occurred according to the timetable.</p> <p>In both cases, the impact was that market participants had less time to carry out their own settlement analysis, but there was no financial impact on the market.</p>

Table 25: Summary of Compliance Rating 2 & 3 Audit Findings

Finding	Compliance & Risk Rating	Description
<p>Poor meter data quality increases risk of incorrect settlement outcomes</p>	 	<p>In addition to the specific non-compliance noted above, we note that:</p> <ul style="list-style-type: none"> Initial meter data often has missing values, and can undergo significant adjustment over subsequent months, including sometimes after the final settlement adjustment has been carried out, more than a year after the initial period. AEMO’s metering system has different requirements for consistency of dates and statuses to meter data provider systems. <p>These issues make it more difficult for AEMO personnel to identify problems with settlement data, increasing the risk of non-compliance incidents in this area.</p> <p>We noted this risk last year, and have reviewed AEMOs meter data processing and validation processes in some detail this year. As a result we are confident that AEMO’s current process is as good as can be expected, given the shortcomings of the provided data.</p> <p>The processes are necessarily manual and time consuming, and significant potential for error remains. At root, the issue is with the format and content of what the Meter Data Agent provides, and with the interaction between the two software systems. While data is provided in a set format, there is no interface contract setting out agreed requirements for consistency or quality of the provided data.</p> <p>We recommend that (either now or as part of the transition of retail market functions to AEMO) AEMO and Meter Data Agents put in place a clear interface contract for meter data provision (including standing data), and maintain the level of effort and focus given to validating and loading meter data.</p>
<p>Internal procedure 2.3.3 Settlement has not been fully updated to reflect 1 July rule changes</p>	 	<p>This internal procedure has not been updated to reflect the new rules around notices of disagreement, and still references notification of System Management (as a provider of SCADA data for metering) rather than a Network Operator.</p> <p>At present, AEMO contracts System Operation services from Western Power, and current processes for settlement disagreements relating to SCADA data still liaise via System Management. We have not observed anything that suggests there has actually been an issue in this area, but correct procedure documentation is an important control for compliance risk. If the procedure were followed as written (not contacting the Network Operator in relation to SCADA data used for settlement), AEMO would not comply with the rules.</p>

13 ELECTRICITY RULES CHAPTER 10 – MARKET INFORMATION

Chapter 10 of the Electricity Rules sets out obligations relating to Market Information, including: confidentiality; and publication on the Market Web Site.

13.1 AEMO processes and procedures

13.1.1 Rule amendments

All the obligations previously placed on the IMO under Chapter 10 have been transferred to AEMO.

13.1.2 Procedures

The following Market Procedures relating to Chapter 10 of the Electricity Rules were updated in the audit period.

ID	Title	Updated
MP 9	Information Confidentiality	November 2015
MP 25	Web Site Changes	November 2015

The following Internal Procedures relating to Chapter 10 were updated in the audit period:

ID	Title	Updated
4.4.3	Publish to Web	December 2015

13.1.3 Compliance of AEMO's Procedures with Chapter 10 of the Electricity Rules

We have not noted any instances in which AEMO's Internal Procedures, if followed, would result in non-compliance with Chapter 10.

13.2 Compliance with Chapter 10

13.2.1 Audit Activities

We have undertaken compliance testing in the following functional area relating to Chapter 10 of the Electricity Rules:

- Email communications of AEMO personnel who have previously worked for a market participant

13.2.2 Audit Findings

Table 26 summarises audit findings by compliance rating and risk rating.

Table 27 provides details of audit findings that were classified as Compliance Rating 1 (i.e. incidents of non-compliance with Chapter 10 of the Electricity Rules).

Table 28 provides details of audit findings that were classified as Compliance Rating 2 and 3.

Table 26: Summary of audit findings classified by compliance and risk ratings

Risk rating	Compliance rating		
	1	2	3
		1	
	1		

Table 27: Summary of Compliance Rating 1 Audit Findings (i.e. incidents of non-compliance with Chapter 10 of the Electricity Rules).

Electricity Rules clause	Risk Rating	Description
<p>10.2.4 (Three breaches)</p>		<p>Clause 10.2.4 of the Electricity Rules states that (subject to limited exceptions) AEMO must not provide information or documents of a given confidentiality status to any person.</p> <ol style="list-style-type: none"> 1. On 22 October 2015, the IMO mistakenly emailed notification of standing data change receipt to a market participant. The email was intended for an internal AEMO staff member, but the sender did not notice that the autocomplete function had populated a participant email address instead. The impact was not material, as the information would not have provided any market advantage. 2. On 2 November 2015, the IMO mistakenly emailed a participant’s loss factor data to another participant. The data had been extracted using a manual query, which had been incorrectly specified. The impact was not material, as the information would not have provided any market advantage. 3. As part of the ongoing Electricity Market Reform to the WEM, IMO and AEMO have received a number of requests for confidential market information to support ongoing policy work from AEMO staff who have been seconded to the Public Utilities Office. IMO and AEMO have provided this information to seconded IMO/AEMO staff via their IMO/AEMO email addresses, intending it to be used in their capacity as IMO/AEMO staff, not as PUO staff. <p>Nevertheless, in at least one case, information was sent to a PUO email address, and has thus been received by the PUO email systems. The PUO is not included on any list of organisations permitted to access information in the various confidentiality classes. While there is a blanket provision for data to be provided to ‘other Regulatory or Government Agencies in accord with applicable laws’, these data requests were not made under a particular law.</p> <p>Nevertheless, the release of information to the PUO aligns with the market objectives, and we cannot see any potential for detrimental impact to the market in sharing it, and likely benefits in sharing it.</p> <p>We recommend that AEMO seek to formalise the permission for otherwise confidential market data to be provided to PUO.</p>

Table 28: Summary of Compliance Rating 2 & 3 Audit Findings

Finding	Compliance & Risk Rating	Description
<p>Increased interest in market data, and staff changes pose risks of confidential information being released</p>		<p>After several years with reducing numbers of confidentiality incidents, we notice an increase this year. Contributing factors include personnel changes in the market operations team, as well as the increasing use of analytics by market participants and the ongoing market reforms, which both increase the level of interest in market data.</p> <p>AEMO has worked to increase the amount of 'self-service' for information requests, with requestors directed to the public data available on the website or to participant specific data via the market participant interface, and reducing the need to extract data using ad-hoc manual queries. This is a good initiative which will reduce the likelihood of non-compliance. We also note planned AEMO-wide initiatives to:</p> <ul style="list-style-type: none"> • provide additional training and support to teams that process high volumes of information or frequently manage sensitive data • update internal training modules for Privacy Awareness and Confidential Information • explore additional technical controls to reduce the likelihood of email being sent to unintended addressees • review organizational confidentiality processes, practices and culture



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Appendix 2 – Independent Assurance Report: Compliance of AEMO’s market software systems and processes for software management



AUSTRALIAN ENERGY MARKET OPERATOR

Independent Assurance Report:
Compliance of AEMO's market software
systems and processes for software
management

FINAL REPORT

9 December 2016



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FOREWORD

PA Consulting Group undertakes the Western Australian (WA) operational market audits which include:

- An Electricity Compliance Audit of the market operator¹ (*Audit 1*)
- An Electricity Software Compliance Audit of the market operator (*Audit 2*)
- A Gas Compliance Audit of the market operator² (*Audit 3*)
- An Electricity Compliance Audit of the system operator³ (*Audit 4*).

This independent assurance report pertains to Audit 2 above and is part of a series of four audit reports. The reports in this series are:

- *Audit 1: Independent Assurance Report: Compliance of AEMO's internal procedures and business processes with the Wholesale Electricity Market Rules and AEMO's compliance with the Wholesale Electricity Market Rules and Market Procedures*
- *Audit 2: Independent Assurance Report: Compliance of AEMO's software systems and processes for software management*
- *Audit 3: Independent Assurance Report: AEMO's compliance with the Gas Services Information Rules*
- *Audit 4: Independent Assurance Report: System Management's compliance with the Wholesale Electricity Market Rules and Market Procedures*

¹ Australian Energy Market Operator (AEMO) from the AEMO Transition Date as defined in the Electricity Rules (8AM, November 30th 2015); Independent Market Operator (IMO) prior to the AEMO Transition Date.

² Australian Energy Market Operator (AEMO) from the AEMO Transition Date as defined in the Gas Rules (8AM, November 30th 2015); Independent Market Operator (IMO) prior to the AEMO Transition Date.

³ Australian Energy Market Operator (AEMO) from the System Management Transition Date as defined in the Electricity Rules (8AM, 1 July 2016); Western Power (System Management) (SM), prior to the System Management Transition Date.

EXECUTIVE SUMMARY

This independent assurance report sets out the results of the market audit by PA Consulting Group in carrying out its audit of the compliance of AEMO's market software and processes for software management with the Wholesale Electricity Market Rules (Electricity Rules) and Market Procedures (Electricity Procedures).

Regulatory context and scope

The audit of AEMO's market software and processes for software management (referred to as Audit 2) is conducted under clause 2.14.3 (c) of the Electricity Rules, supplemented by transitional clause 1.14.7 which requires AEMO to ensure that for the first Market Audit following the AEMO Transition Date⁴, the Market Auditor audits both AEMO (for activities on and from the Transition Date) and the IMO (in respect of its activities before the Transition Date).

Audit Period

The Audit Year is 1 August 2015 to 30 June 2016, both dates inclusive.

Audited Entity

For avoidance of doubt, the Audited Entity for this audit is:

- The Independent Market Operator (IMO) prior to the AEMO Transition Date
- AEMO following the AEMO Transition Date.

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*'.

- Our review of AEMO's software management processes and controls provides limited assurance under ASAE 3000.
- Our review of software changes and of market software compliance with the Electricity Rules and Electricity Procedures provides reasonable assurance under ASAE 3000.

Risk ratings and materiality

Risk ratings

Audit findings are categorised as follows:

⁴ 30 November 2015.

Table 1: Compliance Ratings for Audit Findings

Compliance rating	Description
1	Instances of non-compliance with Electricity Rules and Electricity Procedures noted in audit
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).

Table 2: Risk Ratings for Audit Findings

Risk rating	Description
Critical 	Potential for catastrophic impact on dispatch, settlement or other market outcomes if not addressed immediately. Requires executive actions and monitoring at board level.
Significant 	Potential for major impact on dispatch, settlement 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 dispatch, settlement or other market outcomes if not addressed within a reasonable timeframe. Requires management attention with regular monitoring.
Low 	Potential for minor impact on dispatch, settlement or other market outcomes if not addressed in the future. Requires team level attention with regular monitoring.

Table 3: Risk rating matrix

		Consequence of risks associated with finding				
		Immaterial	Minor	Moderate	Major	Extreme
Likelihood of risk manifesting if finding not addressed	Almost Certain	Medium	Medium	Significant	Critical	Critical
	Likely	Low	Medium	Significant	Critical	Critical
	Possible	Low	Medium	Significant	Significant	Critical
	Unlikely	Low	Low	Medium	Medium	Significant
	Rare	Low	Low	Medium	Medium	Significant

Qualification of audit opinion

In determining whether to qualify our opinion on whether AEMO and IMO have 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 participants
- The number of 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).

Audit activities

We have approached the audit in two components, respectively examining:

1. AEMO's software management processes and controls and
2. Changes to the software itself.

With respect to the software management processes and controls we have:

- Examined the documented processes for software management
- Compared them to actual operational practices through interviews with AEMO staff and inspections of process records
- Reviewed the compliance of operational practices with the Electricity Rules
- Observed the replication of market outputs using a past version of market software to assess compliance with clause 2.36.1(b)⁵.

With respect to the software changes, we have:

- Reviewed all system changes implemented since the last audit;
- Assessed whether those changes have potential for material effect on prices and quantities;
- Reviewed whether or not those changes have been certified as required under the Rules;
- Reviewed all rule changes commencing since the last audit;
- Assessed whether a rule change requires a change to the systems; and
- Identified where those changes have not been implemented.

We conducted one field visit in September 2016 to interview AEMO staff and to walk through the software management processes.

Findings and recommendations

Summary of audit findings

AEMO has maintained IT processes and practices to a high standard during the Audit Period with no changes to the WEMS development process. While the transfer of IMO functions to AEMO has not yet resulted in changes to software management practices, changes are planned to better align processes and tools across all of AEMO's operations.

Table 4 summarises audit findings by compliance and risk rating.

⁵ Specifically, we have reviewed the replication of settlements results for November 2015, which were generated using Settlements version 3.4-9 (deployed into production on 22 September 2015).

Table 4: Summary of audit findings classified by compliance and risk ratings

Risk rating	Compliance rating		
	1	2	3
	0	2	0

Key findings

Current integration testing process poses some risk of unanticipated change to business processes

AEMO’s testing of new software releases is consistent with international good practice, and with other market and system operators. It includes agile development, automated unit test scripts, manually executed functional test scripts, and independent certification of releases potentially affecting market prices and quantities. In our view, it is sufficient to meet the ‘appropriate’ standard set by Rule 2.36.1(c).

Nevertheless, there still remains an opportunity for unanticipated consequences on production systems. During the Audit Period, we observed three instances where software releases introduced minor bugs or unexpected process changes into the production environment.

A common theme was the integration of software into the surrounding business process – for example, one case involved a change to way background publication process worked, introducing an extra manual step being required to publish settlement statements, which was missed the first time, and then a process update subsequently made.

We recommend AEMO reviews the integration testing component of its test practices to ensure that high standards are maintained in future, particularly in view of the significant changes planned for the next audit period.

There is opportunity to improve the change and release management processes for software that is not core market systems

AEMO has identified a number of tools which are external to the core market systems, but are still used in calculations with potential for material impact on market outcomes. These include spreadsheet-based tools which calculate the Maximum Reserve Capacity Price, the Relevant Level for intermittent generators, the Alternative Maximum STEM Price, and GSI Fees.

These tools are not subject to the same rigour of change and release management as the core market software. It can be difficult to determine when a version change occurs, control for inadvertent changes, or specify control points in the update process to manage compliance risk.

We recommend that these tools are formally catalogued, brought under formal source control, and have changes managed via AEMO’s normal change and release processes.

Opinion

Opinion with respect to the compliance of the Audited Entity’s software management processes with the Electricity Rules

Subject to the inherent limitations set out in Section 1.3.4, 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 the Audited Entity’s processes for software management have not been compliant with the Electricity Rules and Electricity Procedures during the Audit Period in all material respects.

Opinion with respect to the compliance of the Audited Entity’s software with the Electricity Rules and Electricity Procedures

Subject to the inherent limitations set out in Section 1.3.4, based on the audit procedures we have performed and the evidence we have examined, it is our opinion that the Audited Entity’s core market software systems have correctly implemented the calculations embodied in the Electricity Rules and Electricity Procedures, in all material respects.

PA Consulting Group



A handwritten signature in black ink, appearing to read 'SJT', is written on a white rectangular background.

Stephen James Thornton
Member of PA’s Management Group

9 December 2016

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1 INTRODUCTION

This chapter sets out the regulatory context for Audit 2 and our approach to performing the audit.

1.1 Regulatory context and scope

The requirement for the audit of the AEMO is set out in the Wholesale Electricity Market Rules (the Electricity Rules).

The table below provides further detail on the heads of power that mandate this audit.

Clause reference	Comment
2.14.1	Requirement for AEMO to appoint market auditor
2.14.2	Requirement for AEMO to ensure market audits are undertaken no less than annually
2.14.3	Defines the scope of the Audit to include: <ul style="list-style-type: none">a. The compliance of AEMO's internal procedures and business processes with the Electricity Rulesb. AEMO's compliance with the Electricity Rules and Market Procedures⁶c. AEMO's market software systems and processes for software management⁷.
2.36.1	Defines obligations with respect to the AEMO's software management systems and controls; this provides the compliance criteria for Audit 2.
1.14.7 (Transitional)	Requires AEMO to ensure that for the first Market Audit following the AEMO Transition Date, the Market Auditor audits both AEMO (for activities on and from the transition date) and the IMO (in respect of its activities before the transition date)

This report covers our audit of AEMO and the IMO under Electricity Rule 2.14.3(c).

1.2 Audited Entity

For avoidance of doubt, the Audited Entity for this audit is:

- The Independent Market Operator (IMO) prior to the AEMO Transition Date
- AEMO following the AEMO Transition Date.

⁶ Market Procedures defined in the Electricity Rules will be referred to from here-on as Electricity Procedures.

⁷ i.e. the compliance of the software with the calculations set out in the Electricity Rules, and the compliance of the software management processes with Clause 2.36.1 of the Electricity Rules.

1.3 Approach

1.3.1 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 limited assurance under this standard with respect to our review of the Audited Entity's software management processes and controls provides limited assurance under ASAE 3000.
- We provide reasonable assurance under this standard with respect to our review of the Audited Entity's software changes and the compliance of AEMO's market software with the Electricity Rules and Electricity Procedures

1.3.2 Risk ratings and materiality

Compliance and risk ratings

Audit findings are categorised as follows:

Table 5: Compliance Ratings for Audit Findings

Compliance rating	Description
1	Instances of non-compliance with Electricity Rules and Electricity Procedures noted in audit.
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 set out in Table 6.

Table 6: Risk Ratings for Audit Findings

Risk rating	Description
Critical 	Potential for catastrophic impact on dispatch, settlement or other market outcomes if not addressed immediately. Requires executive actions and monitoring at board level.
Significant 	Potential for major impact on dispatch, settlement 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 dispatch, settlement or other market outcomes if not addressed within a reasonable timeframe. Requires management attention with regular monitoring.

Risk rating	Description
Low 	Potential for minor impact on dispatch, settlement or other market outcomes if not addressed in the future. Requires team level attention with regular monitoring.

Each finding has been categorised according to its impact and likelihood, using the matrix in Table 7, and AEMO’s standard impact definitions shown in Table 8.

Table 7: Classification of Audit Findings

		Consequence of risks associated with finding				
		Immaterial	Minor	Moderate	Major	Extreme
Likelihood of risk manifesting if finding not addressed	Almost Certain	Medium	Medium	Significant	Critical	Critical
	Likely	Low	Medium	Significant	Critical	Critical
	Possible	Low	Medium	Significant	Significant	Critical
	Unlikely	Low	Low	Medium	Medium	Significant
	Rare	Low	Low	Medium	Medium	Significant

Table 8: 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 or <1 day for electricity market	No restriction of supply No disruption to markets
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

Qualification of audit opinion

In determining whether to qualify our opinion on whether AEMO and IMO have 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 participants
- The number of 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).

1.3.3 Audit activities

We have approached the audit in two components, respectively examining:

3. AEMO’s software management processes and controls and
4. Changes to the software itself.

With respect to the software management processes and controls we have:

- Examined the documented processes for software management
- Compared them to actual operational practices through interviews with AEMO staff and inspections of process records
- Reviewed the compliance of operational practices with the Electricity Rules
- Observed the replication of market outputs using a past version of market software to assess compliance with clause 2.36.1(b)⁸.

With respect to the software changes, we have:

- Reviewed all system changes implemented since the last audit;
- Assessed whether those changes have potential for material effect on prices and quantities;
- Reviewed whether or not those changes have been certified as required under the Rules;
- Reviewed all rule changes commencing since the last audit;
- Assessed whether a rule change requires a change to the systems; and
- Identified where those changes have not been implemented.

We conducted one field-visit in September 2016 to interview AEMO staff and to walk through the software management processes.

All audit information (documentation, logs and system outputs) has been provided to us by AEMO’s Operations and IT team.

1.3.4 Inherent limitations and qualifications

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”

⁸ Specifically, we have reviewed the replication of settlements results for November 2015, which were generated using Settlements version 3.4-9 (deployed into production on 22 September 2015).

- 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 electricity 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 Electricity Rules and Electricity Procedures are therefore subject to the following caveats:

5. 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, in the event that we were to detect any fraudulent or illegal activity, we would report this to AEMO. No such findings have been made during this audit.
6. 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. Specifically, our business process reviews assessing the use of controls were undertaken after the end of the audit period. As such:
 - d. Although our findings are indicative of AEMO's practices during the audit period, they do not constitute definitive evidence that AEMO applied those controls during the audit period.
 - e. Projections of our findings to future periods carry the risk that:
 - i. Controls may become inadequate over time due to changes in the Electricity Rules or AEMO's business processes, procedures and systems
 - ii. The degree of compliance with the control procedures we have reviewed deteriorates over time.

1.4 Structure of this report

The report is in two parts:

- Chapter 2 *Compliance of AEMO's software management processes and controls* reports on the compliance of the market software management processes with the Electricity Rules and Electricity Procedures
- Chapter 3 *Compliance of AEMO software* reports on the compliance of the market software with the Electricity Rules and Electricity Procedures.

2 COMPLIANCE OF AEMO'S SOFTWARE MANAGEMENT PROCESSES AND CONTROLS

Appropriate management of the market software by AEMO is essential given the nature of the business risk to both AEMO and the Western Australia Electricity Market.

This chapter:

- Sets out the Audited Entity's obligations and procedures relating to software management under the Electricity Rules.
- Summarises changes to the Audited Entity's software management processes, procedures and tools since the previous market audit
- Summarises audit findings relating to the Audited Entity's compliance with software management obligations.

2.1 Audited Entity's software management obligations under the Electricity Rules

2.1.1 Rules obligations

The Electricity Rules set out certain obligations with respect to AEMO's software management systems and controls.

The requirements set out in Electricity Rule 2.36.1 are:

Where AEMO uses software systems to determine Balancing Prices, to determine Non-Balancing Facility Dispatch Instruction Payments, to determine LFAS Prices, in the Reserve Capacity Auction, STEM Auction or settlement processes, it must:

- maintain a record of which version of software was used in producing each set of results, and maintain records of the details of the differences between each version and the reasons for the changes between versions;*
- maintain each version of the software in a state where results produced with that version can be reproduced for a period of at least 1 year from the release date of the last results produced with that version;*
- ensure that appropriate testing of new software versions is conducted;*
- ensure that any versions of the software used by AEMO have been certified as being in compliance with the Market Rules by an independent auditor; and*
- require vendors of software audited in accordance with clause 2.36.1(d) to make available to Rule Participants explicit documentation of the functionality of the software adequate for the purpose of audit.*

Rule 2.36.2 defines a 'version' as follows:

A "version" of the software referred to in clause 2.36.1 means any initial software used and any changes to the software that could have a material effect on the prices or quantities resulting from the use of the software.

2.1.2 Procedures

Although there are no relevant Electricity Procedures relating to this subject, there are three relevant Internal Procedures:

- Internal Procedure: IT Support Pack
- Internal Procedure: Software Configuration Management Plan and
- Internal Procedure: WEMS IT Disaster Recovery Plan.

2.2 Changes to software management processes and controls

AEMO has maintained IT processes and practices to a high standard. These robust processes and high levels of automation in market systems continue to be effective controls against compliance risk. No substantial changes to software management process and controls have occurred during the 2015/16 audit period.

AEMO has less ability to control settlement system development practices than it does for WEMS, as the settlement system is developed by a third party vendor, while WEMS is effectively developed in house by AEMO. Nevertheless, AEMO does have ability to manage some parts of the settlement system release lifecycle. Opportunities for further improvement still remain, particularly in the automation of deployments.

2.2.1 Changes to documentation, frameworks and tools

There were no substantive changes to the Software Configuration Management Plan or IT Support Pack internal procedures during the Audit Year. While the transfer of IMO functions to AEMO has not yet resulted in changes to software management practices, changes are planned to better align processes and tools across all of AEMO's operations.

Workflow processes in JIRA⁹ are well established and applied consistently. A continuous build system implemented using Bamboo, automated testing using Junit, and automated certification regression testing using Cucumber (for WEMS and SPARTA) are also well established for the AEMO-developed software systems.

2.2.2 Changes to practice

The WEMS change, test and release cycle continues to perform well. AEMO has automated build and deployment activities, to the point where there is limited scope for manual error in the release process. No substantial changes to software management practices have occurred during the audit year; however, with the transfer of functions to AEMO, there will be a transition to existing AEMO (NEM) practices in the future.

Team staffing changes during the Audit Year have resulted in a reduction in test resources compared with previous years, with no dedicated test management role.

2.3 Compliance of software management processes with the Electricity Rules

2.3.1 General comment on the Audited Entity's compliance with clause 2.36.1

Subject to Section 2.3.2, AEMO's software management processes remain sufficient to comply with clause 2.36.1 of the Electricity Rules.

⁹ AEMO's workflow tool, used for development activities as well as operational support.

Table 9: Comment on the Audited Entity's compliance with clause 2.36.1 of the Electricity Rules during the Audit Year

Clause	Comment on compliance
2.36.1(a)	The Audited Entity has maintained a record of all versions of market software used together with their dates in service, details of the differences between each version and the reasons for the changes between versions. These take the form of release notes, JIRA records and database entries.
2.36.1(b)	The Audited Entity has maintained the ability to roll back versions of the market software by restoring previous database versions and re-installing previous versions of the software. AEMO was able to reproduce past results exactly for a sample case ¹⁰ .
2.36.1(c)	The Audited Entity has conducted appropriate testing on all new releases of market software prior to their being placed in service.
2.36.1(d)	The Audited Entity has ensured that all software versions are covered by an independent certification prior to implementation (subject to the observations noted in section 2.3.2).
2.36.1(e)	The Audited Entity has provided us with documentation on the functionality of the market software. AEMO also holds release artefacts including detailed release notes for each release. Given the degree of confidentiality over the software imposed by the vendors, PA accepts that the degree to which AEMO provides documentation is sufficient for compliance with this Electricity Rule clause.

2.3.2 Audit Findings

There have been no self-reported or other instances of non-compliance with clause 2.36.1 of the Electricity Rules.

Table 10 summarises audit findings by compliance rating and risk rating.

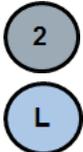
Table 11 provides details of audit findings that were classified as Compliance Rating 2 and 3.

Table 10: Summary of audit findings classified by compliance and risk ratings

Risk rating	Compliance rating		
	1	2	3
	0	2	0

¹⁰ Specifically, the Settlements results for November 2015, which were generated using Settlements version 3.4-9 which was deployed into production on 22 September 2015.

Table 11: Summary of Compliance Rating 2 & 3 Audit Findings

Finding	Compliance & Risk Rating	Description
<p>Current process for testing software releases poses some risk of bugs and defects being missed</p>		<p>AEMO's testing of new software releases is consistent with standard international practices, and with other market and system operators. It includes agile development, automated unit test scripts, manually executed functional test scripts, and independent certification of releases potentially affecting market prices and quantities. In our view, it is sufficient to meet the 'appropriate' standard set by Rule 2.36.1(c).</p> <p>AEMO's testing of AEMO-developed software releases consists of:</p> <ul style="list-style-type: none"> • A set of automated unit test scripts that are run automatically as part of the build process • A set of manually executed functional test scripts that are performed by specialist test staff <p>The automated unit tests are run on every software build, so every version released into production will have had the full set of these tests run on it prior to release.</p> <p>A full set of manual functional tests is not generally run on the same software versions that are released into production. This is due to the agile development process that has been adopted by AEMO, which results in numerous and frequent software builds being generated prior to the release version. This process is in line with standard international practices for organisations of this type.</p> <p>While this process provides an adequate compromise between robust software testing and timely release of software changes, there still remains an opportunity for unanticipated consequences on production systems.. During the Audit Period, we observed three instances where software releases introduced minor bugs or unexpected process changes into the production environment. Two resulting market breaches, (described in our Audit 1 report) highlight the importance of rigorous software testing, in particular within an integrated environment.</p> <p>A common theme was the integration of software into the surrounding business process – for example, one case involved a change to way background publication process worked, introducing an extra manual step being required to publish settlement statements, which was missed the first time, and then a process update subsequently made.</p> <p>While these observations do not mean that AEMO does not carry out appropriate testing of market software releases, they do highlight increased risk of future non-compliance. We recommend AEMO reviews the integration testing component of its test practices to ensure that high standards are maintained in future, particularly in view of the significant changes planned for the next audit period.</p>
<p>There is opportunity to improve the change and release management processes for software that is not core market systems</p>		<p>AEMO has identified a number of tools which are external to the core market systems, but are still used in calculations with potential for material impact on market outcomes. These include spreadsheet-based tools which calculate the Maximum Reserve Capacity Price, the Relevant Level for intermittent generators, the Alternative Maximum STEM Price, and GSI Fees.</p> <p>For the purposes of compliance with the Electricity Rules, it is unclear whether these tools – many in spreadsheet form – are covered under the 'market software systems' referred to in clause 2.36.1. Nonetheless, AEMO has determined that as</p>

Finding	Compliance & Risk Rating	Description
		<p>part of prudent operation of the market, these tools should also be subject to certification where they meet the criteria in the Internal Procedure: Market Audits.</p> <p>These tools are not subject to the same rigour of change and release management as the core market software. It can be difficult to determine when a version change occurs, control for inadvertent changes, or specify control points in the update process to manage compliance risk.</p> <p>We recommend that these tools are formally catalogued, brought under formal source control, and have changes managed via AEMO's normal change and release processes.</p>

3 COMPLIANCE OF AEMO SOFTWARE

This chapter sets out our findings with respect to the compliance of AEMO's market software with the Electricity Rules and Electricity Procedures.

The software systems covered by this section of the review are the core market systems¹¹:

- The Reserve Capacity system;
- The Energy Market systems (including the Short Term Energy Market, the Balancing Market and the Load Following Ancillary Service Market); and
- The Settlement systems.

The chapter is structured as follows:

- Section 3.1 sets out PA's approach to certifying releases of market software (as required under clause 2.36.1(d) of the Electricity Rules).
- Section 3.2 summarises changes to core market systems (and other software as relevant) during the Audit Year
- Section 3.3 summarises our audit findings.

As independent certification testing is focused on areas of change, and does not necessarily include a full regression test of all functionality, our certification depends on the chain of testing completed since the most recent test of all functionality. For this reason, we include a summary of historical market software changes that have been certified prior to this Audit Period in Appendix 1.

3.1 Approach taken to certifying the market software

Software testing and certification under MR 2.36.1(d) is carried out on a release by release basis throughout the year. Hence, at the time of the annual market audit (this Audit 2), we rely upon the testing conducted throughout the year and our review of the Audited Entity's software release change log (and other documentation) to determine:

- Whether all changes to market software contemplated by clause 2.36.1(d) have been independently certified, and therefore
- Whether all market software contemplated by clause 2.36.1(d) is still compliant with the Electricity Rules and Electricity Procedures.

Below, we describe further the approaches that we use for auditing the compliance of market software with the Electricity Rules and Electricity Procedures.

¹¹ Where a tool outside of the core market systems has been tested and certified, that certification is also covered.

3.1.1 Initial software testing

When AEMO notifies us of changes to market software or release of new software we adopt one or both of the following methods:

- Constructing independent models of the specific case. The model may perform a set of calculations (such as pre-processing of data or quantity allocations, as defined by the formulation), or it may include an optimisation procedure designed to replicate a portion of the software's formulation.
- Directly comparing the software results to our understanding of the formulation. This may involve answering questions such as:
 - Are the appropriate constraints binding?
 - Does the set of calculations change as we expect when input values are altered and the software is re-run?
 - Does the software make optimal trade-offs between alternative resources, given their costs and associated constraints?

In testing AEMO's market software, we use both approaches.

As much of the software tested is embedded in the market systems, PA specifies the tests to be performed (including input data requirements and output data to be provided) and AEMO staff conducts the tests on the market systems. PA then reviews the test results to determine whether the results are compliant with the requirements of the Electricity Rules and Electricity Procedures.

3.1.2 Assessment of software compliance at time of market audit

Once software has been tested and shown to be compliant, it is not necessary to retest the software unless:

- Changes have been known to be made to the software which render the previous testing no longer valid; or
- It is believed that unapproved changes have been made to the software.

The first circumstance is readily picked up where there is a rigorous software change control procedure. The second exists where such a change control procedure is lacking.

As part of the 2006-7 and 2007-8 annual audits of the IMO's market software systems we carried out full regression tests to verify that the market software systems comply with the requirements of the Electricity Rules and Electricity Procedures. Since the 2008-9 year, we have determined the compliance of the market software by:

- Examining the IMO's market software change procedures to ensure that they are robust
- Examining various records of changes made to the market software systems (including change process logs, release notes and system audit trails) to determine whether the changes required independent testing and certification
- Examining Electricity Rule and Procedure changes and assessing whether corresponding changes to market software have been implemented (where relevant) and
- Carrying out such testing and certification on those software changes as required.

Under this regime, if there are no changes made to the software since the last time it was certified, we may deduce that the software continues to comply with the Electricity Rules.

If changes are made to the software, we plan and conduct tests to exercise any new or changed calculations, and other calculations that are likely to have been affected.

This is in line with the approach we use when verifying software compliance in other jurisdictions.

This incremental approach provides a cost-effective means for providing assurance on compliance when changes to the market are incremental in nature, but it becomes less meaningful as time goes on and/or if major changes are introduced to the market.

3.2 2015-16 market software certification

3.2.1 Electricity Rules changes in the Audit Period

There were three Electricity Rule changes commencing between 1 August 2015 and 30 June 2016.

- No software changes were required in response to the RC_2015_05 (1 September 2015) which related to transitional provisions for the 2015 Reserve Capacity Cycle.
- WEMS release 3.13-981-1 was required in response to the transfer of IMO functions to AEMO as part of the 30 November 2015 rule change.
- WEMS release 3.16-1105-2 was required in response to the Reserve Capacity Mechanism changes in the 1 June 2016 rule change.

3.2.2 Certification of core market systems

There were seven releases of new market systems software, two releases of new settlement software and two releases of new metering software between 1 August 2015 and 30 June 2016.

Most changes maintained certification without additional testing, as they did not involve changes that would be expected to have material impact on prices or quantities. All releases having material impact on market prices or quantities were independently certified prior to release. The changes are set out in Table 12, along with the certification status of the software version. The list only includes releases implemented in the production environment, and does not include versions which were only implemented in a development or test environment.

Table 12: Production software changes in the 2015-16 audit period

System	Version number	Release date	Changes to calculations affecting market outcomes?	Certification status	Comment
Settlements	3.4.9	22/09/2015	No	Maintained	
WEMS	3.12-913-9	23/09/2015	Yes	Certified	Reimplementation of core calculation modules. No change to calculations themselves.
WEMS	3.12-913-35	28/10/2015	No	Maintained	
Settlements	3.4.12	2/12/2015	No	Maintained	IMO functions transferred to AEMO
WEMS	3.13-981-1	29/11/2015	No	Maintained	IMO functions transferred to AEMO
WEMS	3.13-981-6	13/01/2016	No	Maintained	
Metering	11.0.25	09/02/2016	No	Maintained	
WEMS	3.14-1016-3	3/03/2016	No	Maintained	
WEMS	3.14-1016-4	14/03/2016	No	Maintained	
Metering	11.0.27	24/05/2016	No	Maintained	
WEMS	3.16-1105-2	25/05/2016	Yes	Certified	RCM changes implemented for 1 June 2016 rule change.

Where the above software is designated 'Certified', it has either been independently tested by PA, or AEMO testing has been reviewed and accepted by PA. PA has then certified that the software complies with the requirements of the Electricity Rules.

3.2.3 Certification of tools outside core market systems

Only one supporting tool (SPARTA v1.5, 27 November 2015) received certification during the audit period.

3.3 Audit findings

We have reviewed the relevant AEMO IT system change control logs (including release notes, JIRA records, and database logs) and have confirmed that, other than the changes set out in section 3.2, the core market systems and the non-core market software referenced in Section 3.2.3 have not been materially changed since the referenced tests were performed.

As such, as at the time of the market audit, we found all market software (contemplated by clause 2.36.1(d)) and non-core market software referenced in Section 3.2.3 to be compliant with the Electricity Rules and Electricity Procedures, in all material respects.

Hence, we have no audit findings relating to this chapter.

A HISTORICAL MARKET SOFTWARE CERTIFICATION PRIOR TO THE 2015-16 AUDIT PERIOD

This section provides a summary of the relevant certification tests previously conducted on the core AEMO market software systems along with the results of those tests. The core market software systems are comprised of:

- WEMS – Wholesale Electricity Market Systems, a software system developed and maintained by AEMO, and incorporating proprietary components provided by ABB
- POMAX Settlements – a software system provided by the vendor Brady Energy
- POMAX Metering – a software system provided by the vendor Brady Energy

WEMS certification relies on the chain of certification testing back to the comprehensive testing conducted in 2007-8. We conducted comprehensive testing of new WEMS components for the introduction of balancing and load following markets in 2012.

Settlements certification is based on the chain of certification testing back to the comprehensive testing conducted in 2014 for the new settlements version 3.4.6.

For the 2008-2011 audit periods, the information presented is organised around the tests conducted and sets out:

- The features of Market Systems software which have been tested;
- The nature of the tests conducted.

For the 2011-2015 audit periods, we set out the specific market software component releases, and their certification status. 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 13: Summary of previous tests conducted 2008-2011

System	Subject	Test	Result	Year
Market Systems	STEM & Non-STEM	STEM ST1: Two Participants	PASS	2008
		STEM ST2: Multiple Optima Clearing Quantities	PASS	2008
		STEM ST3: Multiple Optima Clearing Prices	PASS	2008
		STEM ST4: Price set at Min-STEM price by default bid	PASS	2008
		STEM ST5: Price set at Alt-Max-STEM price by default bid	PASS	2008
		STEM ST6: Bilateral position outside of Price Curve	PASS	2008
		STEM ST7: Three Participants	PASS	2008
		NST 1 Dispatch Merit Order	PASS	2008
		NST 2 Dispatch Instructions	PASS	2008
		NST 3 Administered Balancing Prices	PASS	2008
		NST 4 Reserve Capacity Obligation Quantities		

System	Subject	Test	Result	Year
Market Systems	Non-STEM	Maximum Alternative Maximum Stem Price calculation	PASS	2008
Market Systems	Non-STEM	Incremental Reserve Capacity Ratio calculation	PASS	2008
Market Systems	Non-STEM	Prudential Requirements calculation	PASS	2008
Market Systems	STEM & Non-STEM	Change to the resource plan calculation	PASS	2009
Settlement	Other Settlement	Settlement of intermittent load generators	PASS	2009
Market Systems	Reserve Capacity	Supplementary Reserve Capacity calculation	PASS	2009
Market Systems	STEM	Inclusion of more than 50 participants in STEM auction and dispatch merit order calculations	PASS	2011

Table 14: Production software changes in the 2011-15 audit periods

System	Version number	Changes to calculations affecting market outcomes?	Certification status
WEMS	2.6.6	No	Maintained
WEMS	2.6.7	Yes	Certified
WEMS	2.6.8	No	Maintained
WEMS	2.7.37	No	Maintained
WEMS	2.7.39	No	Maintained
WEMS	2.7.41	No	Maintained
WEMS	2.8.28	No	Maintained
WEMS	2.8.29	No	Maintained
WEMS	3.0.18	No	Maintained
WEMS	3.0.21	Yes	Certified
WEMS	3.1.36	No	Maintained
WEMS	3.1.41	No	Maintained
WEMS	3.1.43	Yes	Certified
WEMS	3.1.44	Yes	Certified
WEMS	3.1.45	No	Maintained
WEMS	3.2.8	No	Maintained

System	Version number	Changes to calculations affecting market outcomes?	Certification status
WEMS	3.3.12	No	Maintained
WEMS	3.4.11	Yes	Certified
WEMS	3.5.6	Yes	Certified
WEMS	3.6.12	Yes	Certified
WEMS	3.6.13	No	Maintained
WEMS	3.6.15	No	Maintained
WEMS	3.6.16	No	Maintained
WEMS	3.7.9	No	Maintained
WEMS	3.7.12	No	Maintained
WEMS	3.7.13	Yes	Certified
WEMS	3.8.5	No	Maintained
WEMS	3.8.6	No	Maintained
WEMS	3.9.2	Yes	Certified
WEMS	3.9.2 (AS-2456)	Yes	Certified
WEMS	3.10.99-15	Yes	Certified
WEMS	3.10.99-59	No	Maintained
Metering	11 update 14	Yes	Certified
Metering	11.0.20	No	Maintained
Settlements	3.4.6	Yes	Certified
Settlements	3.4.7	No	Maintained
Settlements	3.4.8	Yes	Certified
WEMS	3.10-99-63	No	Maintained
WEMS	3.10-99-71	No	Maintained
WEMS	3.11.374-57	No	Maintained
WEMS	3.11.374-63	No	Maintained
WEMS	3.11.374-81	No	Maintained
WEMS	3.11.374-84	No	Maintained
WEMS	3.11.374-94	No	Maintained

System	Version number	Changes to calculations affecting market outcomes?	Certification status
WEMS	3.11.374-116	No	Maintained
WEMS	3.11.374-128	No	Maintained



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Appendix 3 – Independent Assurance Report: System Management’s compliance with the Wholesale Electricity Market Rules and Market Procedures



AUSTRALIAN ENERGY MARKET OPERATOR

Independent Assurance Report: System
Management's compliance with the
Wholesale Electricity Market Rules and
Market Procedures

FINAL REPORT

9 December 2016



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FINAL 1

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FOREWORD

PA Consulting Group undertakes the Western Australian (WA) operational market audits which include:

- An Electricity Compliance Audit of the market operator¹ (*Audit 1*)
- An Electricity Software Compliance Audit of the market operator (*Audit 2*)
- A Gas Compliance Audit of the market operator² (*Audit 3*)
- An Electricity Compliance Audit of the system operator³ (*Audit 4*).

This independent assurance report pertains to Audit 4 above and is part of a series of four audit reports. The reports in this series are:

- *Audit 1: Independent Assurance Report: Compliance of AEMO's internal procedures and business processes with the Wholesale Electricity Market Rules and AEMO's compliance with the Wholesale Electricity Market Rules and Market Procedures*
- *Audit 2: Independent Assurance Report: Compliance of AEMO's software systems and processes for software management*
- *Audit 3: Independent Assurance Report: AEMO's compliance with the Gas Services Information Rules*
- *Audit 4: Independent Assurance Report: System Management's compliance with the Wholesale Electricity Market Rules and Market Procedures*

¹ Australian Energy Market Operator (AEMO) from the AEMO Transition Date as defined in the Electricity Rules (8AM, November 30th 2015); Independent Market Operator (IMO) prior to the AEMO Transition Date.

² Australian Energy Market Operator (AEMO) from the AEMO Transition Date as defined in the Gas Rules (8AM, November 30th 2015); Independent Market Operator (IMO) prior to the AEMO Transition Date.

³ Australian Energy Market Operator (AEMO) from the System Management Transition Date as defined in the Electricity Rules (8AM, 1 July 2016); Western Power (System Management) (SM), prior to the System Management Transition Date.

EXECUTIVE SUMMARY

This independent assurance report sets out the results of the market audit by PA Consulting Group assessing System Management's compliance with the Wholesale Electricity Market Rules (Electricity Rules) and Market Procedures (Electricity Procedures)⁴.

Regulatory context and scope

The audit of System Management (referred to as Audit 4) is conducted under (transitional) clause 1.16.4 of the Electricity Market Rules which requires AEMO to ensure that for the first Market Audit following the System Management Transition Date, the Market Auditor audits both AEMO (with respect to clause 2.14.3) and Western Power (in its former capacity as System Management).

See Section 1.1 for further details on regulatory context.

Audit Period

The Audit Year is 1 August 2015 to 30 June 2016, both dates inclusive. We also report some findings from activities in July and August 2016⁵.

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' and provides limited assurance under this standard.

Risk ratings and materiality

Risk ratings

Audit findings are categorised as follows:

Table 1: Compliance Ratings for Audit Findings

Compliance rating	Description
1	Instances of non-compliance with Electricity Rules and Electricity Procedures noted in audit
2	Findings that are not an instance of non-compliance, but pose compliance risk

⁴ For avoidance of doubt, the term Electricity Procedure includes System Management's Power System Operation Procedure.

⁵ In past years, the audit year has ended on 31 July, and our site visit has occurred in August, immediately after the end of the audit year. This year, we have an 11 month audit period ending on 30 June (chosen to coincide with the System Management Transition date), and a site visit beginning in mid-September, giving rise to an unusually large gap of 10 weeks between the end of the audit year and our site visit. We have therefore chosen to report some findings from activities in July and August, rather than deferring reporting until the next audit.

Compliance rating	Description
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.

Table 2: Risk Ratings for Audit Findings

Risk rating	Description
Critical 	Potential for catastrophic impact on dispatch, settlement or other market outcomes if not addressed immediately. Requires executive actions and monitoring at board level.
Significant 	Potential for major impact on dispatch, settlement 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 dispatch, settlement or other market outcomes if not addressed within a reasonable timeframe. Requires management attention with regular monitoring.
Low 	Potential for minor impact on dispatch, settlement or other market outcomes if not addressed in the future. Requires team level attention with regular monitoring.

Materiality

In determining materiality 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 participants
- The number of 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).

Audit activities

We have undertaken a combination of reviews of self-reported and IMO/AEMO alleged incidents of System Management non-compliance, compliance auditing and business process walkthroughs.

Our audit activities were focussed on subset of functional areas based on residual compliance risk and materiality. These areas include:

- Dispatch

- Declaration of High Risk and Emergency Operating States
- Short-term (ST) PASA
- Outage planning and approval
- Approval of commissioning tests
- Preparation and transmission of settlement information to AEMO.

In past audits, we have also focussed on areas that have undergone change due to Electricity Rule/Procedure changes or major system changes. During the audit period, there have been no major changes to System Management’s obligations. Changes to System Management’s obligations have involved minor wording changes or transitional changes to reflect AEMO’s new role.

We conducted one field-visit in September 2016 to interview AEMO and System Management staff and to conduct the business process walkthroughs.

Findings and recommendations

Summary of audit findings

Table 3 summarises audit findings by compliance and risk rating.

- The majority of breaches of the Electricity Rules (Compliance Rating 1) related to errors or oversights relating to a manual process. In particular, we have noted multiple breaches of Clause 7.13.1 of the Electricity Rules relating to System Management’s obligations with respect to preparing and transmitting settlement data to AEMO.
- As in past years, there have been recurring breaches of System Management’s dispatch advisory obligations (under Section 7.11 of the Electricity Rules).
- We have noted only one significant risk breach and this pertains to a breach of clauses 7.6.1C and 7.6.1D (Dispatch Criteria) where System Management dispatched a facility out of merit as a result of an IT issue (whereby outdated BMOs were used for dispatch). This particular breach had a low market impact (as the issue started at midnight and persisted till 6:30 am; there is not much variation in offers during this period; hence the outdated BMOs would have reflected the correct dispatch). However, we have deemed this to be a significant breach as similar issues have recurred three times (outside the audit period). These incidents are still being reviewed by AEMO but are likely to have resulted in multiple breaches of the Dispatch Criteria.

Table 3: Summary of audit findings classified by compliance and risk ratings

Risk rating	Compliance rating		
	1	2	3
	0	0	0
	1	3	0
	11	6	0

Risk rating	Compliance rating		
	1	2	3
	11	2	1

Table 4 breaks down the audit findings further by chapter of the Electricity Rules. Subsequent sections of this report provide a detailed explanation of each finding on rule chapter by chapter basis.

Table 4: Summary of audit findings broken by chapter of Electricity Rules

Chapter	Compliance rating		
	1	2	3
3: Power System Security and Reliability	 2	 1	 1
	 2	 1	
7: Dispatch	 1	 2	No findings
	 6	 5	
	 7	 2	
7A: Balancing Market	 1	No findings	No findings
	 1		
7B: Load following Market	 0	No findings	No findings
	 1		
	 1		
9: Settlement	 1	No findings	No findings

Key findings

Control room staffing risk

The upcoming departure of experienced control room operators poses significant risk to power system security and market dispatch obligations (particularly in light of patchy process documentation in this area)

We understand that none of the experienced Western Power (System Management) control room operators have accepted AEMO's offer with respect to the transfer of system operations functions to AEMO. However,

- AEMO is in the process of recruiting new control room operators and is currently developing a competency based training plan for these new recruits.
- There are plans to extend the System Management control room operator contracts to at least April 2017 (and potentially to October 2017) to facilitate succession planning.

Nevertheless, we note there is significant risk associated with placing new recruits without previous power system operations experience in the control room with only a few months of training (including simulation training). This risk is even more severe during bush-fire season (January – February) when there are often multiple instances of High Risk and Emergency Operating State declarations. For example, if the experienced controllers all depart in 2017, then the new recruits will have to manage the control room without veteran experience during the 2018 bush fire season. As above, we note significant risk in this respect.

We further note that there is still no documented process documentation relating to control room operations (significant work has been done updating Control Room Instructions (CRIs); however, these are facility specific documents and have not as yet formally approved. There are, as yet no high level documents outlining the dispatch process and other aspects of control room operations⁶).

Level of staffing in control room poses risk to security and dispatch obligations

We reiterate our findings from previous years that the low staffing levels in the control room pose significant compliance risk (there is only one controller on shift (with two shifts per day)). This practice is not consistent with the practice of comparable system operators internationally. Specifically:

- In high-risk or emergency situations it can be challenging for a single controller handle both security and dispatch creating scope for non-compliance. Such scenarios are likely to arise during summer peak intervals and carry with them high risk of dispatch non-compliance and/or non-compliance with power system security obligations.
- The timeliness issues around dispatch advisories is related, in part, to a single controller being on shift. The controller may be too occupied with security and dispatch issues to notify market operations staff of the need to issue an advisory.
- In the event that a controller becomes incapable carrying out their duties (e.g. due to sickness or other unforeseen circumstances), the control desk may remain unattended until a replacement controller arrives to take over the shift.

We have also noted practices in the control room⁷ that may lead to market outcomes that are inconsistent with market objectives relating to economic efficiency: here we have noted that an increased level of staffing in the control room can help improve these practices to achieve outcomes that are better aligned with the Electricity Rules objectives.

We note that System Management has, in its recent allowable revenue submission, requested budget for a security controller in the control room. As at the time of the audit, however, there was no change to the level of resourcing in the control room.

⁶ System Management has advised they have plans to develop this documentation.

⁷ For example, using Synergy facilities to manage the LFAS position (instead of using the marginal BMO plant) and keeping the same constraints in place until security issues have been resolved (as opposed to redoing the security analysis in each trading interval to ensure the correct plants are still being constrained – in light of changed BMO offers).

Repeat issues with IT systems availability and performance poses significant risk to market dispatch compliance outcomes

We have noted four instances (one falling within the audit period, and three falling outside the audit period) where IT systems issues have resulted in multiple breaches of the Dispatch Criteria set out in Clause 7.6C of the Electricity Rules (where System Management has been unable to load the latest BMOs from AEMO).

We note AEMO plans to undertake a due diligence on System Management's market systems to better understand the level of risk.

Given the recurrence of this issue and the potential financial impact on multiple participants, we have deemed this to be a significant audit finding.

Governance of processes continues to pose compliance risk

We reiterate our previous audit findings in relation to process governance:

- Process documentation is still lacking. Although System Management has made some progress developing CRIs (see above), process documentation in all areas is patchy or non-existent (except market operations where the level of documentation is thorough). We note particular risks in the processes currently undertaken by the System Operations Planning Engineers (SOPEs). Many of these processes are manual in nature and have no process documentation. We understand that after the AEMO transfer, there will likely be new recruits performing SOPE functions who would benefit from process documentation. We therefore recommend business process documentation be developed for these processes immediately to support new SOPE recruits.
- There is opportunity to improve the level of audit trail for control room activities. For example:
 - The current level of audit trail makes it particularly difficult to determine SM's basis for out of merit dispatch and declaration of high-risk or emergency operating states; both of these areas are of material importance to the market.
 - We have noted six instances during the audit period where the control room operator has overridden the Metrix load forecast (sent to AEMO and used to calculate the BMO), but where System Management has been unable to provide the rationale for the override (as the Metrix forecast was tracking well against actual SCADA outputs at the time of the override) – see also Chapter
 - The Synergy dispatch process is opaque and the audit trail for dispatch decisions around Synergy facilities is intractable.

Timeliness and usefulness of Dispatch Advisories are a continuing concern

In past audits we have noted multiple breaches relating to the provision of Dispatch Advisories to market participants. The breaches are a result of:

- A manual process for issuing advisories.
- Inability of market operations staff to remotely access the dispatch advisory system after hours (control room operators assert that they cannot conduct dispatch/security activities and release advisories).

The vast majority of information is relayed without incident. However, as indicated above, the current dispatch advisory mechanism may not be the most efficient way to provide the necessary information to the market; as a result, there are often instances when Dispatch Advisories are sent out late or without the information required under the rules (including information about the location and quantity of out-of-merit dispatch).

Delays or failures in notifying market participants of out-of-merit dispatch, significant outages, or other significant events compromise market transparency and can compromise efficient decision making by participants.

Opinion

Qualifications

The following qualifications apply to our opinion with respect to whether System Management has complied with the Electricity Rules in all material respects:

- System Management has breached the Dispatch Criteria (clauses 7.6.1C and 7.6.1D) once during the audit period. Nevertheless we consider this to be a material non-compliance due to previously recurring breaches (from previous audits) in this area **and** the recurring episodes in outside the audit period and the potential financial impacts on market participants should similar breaches continue to recur.
- System Management has breached its Dispatch Advisory obligations under Section 7.11 of the Electricity Rules multiple times during the audit period. This is a recurring issue that we have noted for several past audits. Failure to provide participants with timely and accurate information can compromise market transparency objectives and efficient decision making by participants.
- System Management has breached its obligations to provide up to date load forecast information to AEMO under clause 7A.3.15 seven times during the audit period. Although the impact of these breaches are likely to be immaterial, this is a recurring finding. System Management does not have the means to send alternate load forecasts to AEMO. Therefore, in instances where System Management uses an alternate load forecast for an extended period of time, AEMO would rely on outdated load forecast information when calculating the BMO.

Conclusion

Our opinion is as follows.

Subject to the inherent limitations set out in Section 1.2.4 and the qualifications set out above, 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 System Management has not been compliant with the Electricity Rules and Market Procedures during the audit period, in all material respects.

PA Consulting Group



A handwritten signature in black ink, appearing to read 'SJT', written over a light blue horizontal line.

Stephen James Thornton

Member of PA's Management Group

9 December 2016

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1 INTRODUCTION

This chapter sets out the regulatory context for Audit 4 and our approach to performing the audit.

1.1 Regulatory context and scope

The requirement for the audit of System Management is set out in the **Wholesale Electricity Market Rules** (the *Electricity Rules*).

Table 1 provides further detail on the heads of power that mandate this audit.

Table 5: Electricity Market Rules references pertaining to Market Audits

Clause reference	Comment
2.14.1	Requirement for AEMO to appoint market auditor
2.14.2	Requirement for AEMO to ensure market audits are undertaken no less than annually
2.14.3	Defines the scope of the Audit to include: <ul style="list-style-type: none">• The compliance of AEMO's internal procedures and business processes with the Electricity Rules• AEMO's compliance with the Electricity Rules and Market Procedures⁸• AEMO's market software systems and processes for software management⁹.
2.14.6 ¹⁰	This rule provided the head of power for Audit 4 prior to the System Management Transition Date; the IMO was required to review System Management's compliance on an annual basis. After the System Management Transition Date, however, AEMO becomes the audited entity, and therefore the head of power for Audit 4 will be Clause 2.14.1, 2.14.2 & 2.14.3. In future market audits, Audit 4 will be rolled into Audit 1 (covering AEMO's dual role as market and system operator).
1.16.4 (Transitional)	Requires AEMO to ensure that for the first Market Audit following the System Management Transition Date, the Market Auditor audits both AEMO (with respect to clause 2.14.3) and Western Power (in its former capacity as System Management).

⁸ Market Procedures defined in the Electricity Rules will be referred to from here-on as Electricity Procedures. For avoidance of doubt, the term Electricity Procedure includes the Power System Operation Procedure.

⁹ i.e. the compliance of the software with the calculations set out in the Electricity Rules, and the compliance of the software management processes with Clause 2.36.1 of the Electricity Rules.

¹⁰ As at 30 Nov 2015 (blank since 1 July 2016):

In accordance with the Monitoring Protocol, the IMO must at least annually, and may more frequently where it reasonably considers that System Management may not be complying with the Market Rules and Market Procedures:

(a) require System Management to demonstrate compliance with the Market Rules and Market Procedures by providing such records as are required to be kept under these Market Rules or any Market Procedure; or

(b) subject System Management to an audit by the Market Auditor to verify compliance with the Market Rules and Market Procedures

This report covers our audit of System Management functions.

For avoidance of doubt, the Audit Year spans 1 August 2015 to 30 June 2016; therefore head of power for Audit 4 is derived from clause 2.14.6 of the Electricity Rules (but will derive from clauses 2.14.1, 2.14.2 & 2.14.3 for subsequent audits)

1.2 Approach

1.2.1 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' and provides limited assurance under this standard.

1.2.2 Risk ratings and materiality

Compliance and Risk ratings

Audit findings are categorised as follows:

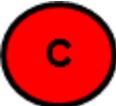
Table 6: Compliance Ratings for Audit Findings

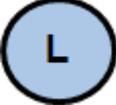
Compliance rating	Description
1	Instances of non-compliance with Electricity Rules and Electricity Procedures noted in audit.
2	Findings that are not an instance of non-compliance, but pose compliance risk
3	Findings related to minor housekeeping issues that do not affect compliance risk

Materiality rating descriptors for audit findings were set in consultation with AEMO and are summarised below. Dimensions of risk (denoted in the matrix below) are defined in accordance with AEMO's corporate risk matrix.

Table 7: Risk Ratings for Audit Findings

		Consequence of risks associated with finding				
		Immaterial	Minor	Moderate	Major	Extreme
Likelihood of risk manifesting if finding not addressed	Almost Certain	Medium	Medium	Significant	Critical	Critical
	Likely	Low	Medium	Significant	Critical	Critical
	Possible	Low	Medium	Significant	Significant	Critical
	Unlikely	Low	Low	Medium	Medium	Significant
	Rare	Low	Low	Medium	Medium	Significant

Risk rating	Description
Critical 	Potential for catastrophic impact on dispatch, settlement or other market outcomes if not addressed immediately. Requires executive actions and monitoring at board level.

Risk rating	Description
Significant 	Potential for major impact on dispatch, settlement 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 dispatch, settlement or other market outcomes if not addressed within a reasonable timeframe. Requires management attention with regular monitoring.
Low 	Potential for minor impact on dispatch, settlement or other market outcomes if not addressed in the future. Requires team level attention with regular monitoring.

Materiality

In determining materiality 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 participants
- The number of 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).

1.2.3 Audit activities

We have undertaken a combination of:

- Reviewing System Management and AEMO reported incidents of System Management non-compliance with the Electricity Rules and Electricity 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.
- Compliance testing to audit System Management's operational compliance with the Electricity Rules and Electricity Procedures and to determine the effectiveness of operating controls. In doing so, we have requested information and data primarily from System Management, but also from AEMO.

The first two activities were conducted as part of a field-visit in September 2016. Remaining activities have been undertaken remotely.

Compliance testing and business process walkthroughs were focussed on subset of functional areas based on residual compliance risk and materiality. These areas include:

- Dispatch which includes:
 - Real-time dispatch and security management in the control room

- Use of the Real-Time-Dispatch-Engine (RTDE) to implement the Dispatch Criteria (Section 7.6) of the Electricity Rules
- Synergy Dispatch Planning
- Load forecasting
- Declaration of High Risk and Emergency Operating States
- Short-term (ST) PASA
- Outage planning and approval
- Approval of commissioning tests
- Preparation and transmission of settlement information to AEMO

In past audits, we have also focussed on areas that have undergone change due to Electricity Rule/Procedure changes or major system changes. During the audit period, there have been no major changes to System Management’s obligations. Changes to System Management’s obligations have involved minor wording changes or transitional changes to reflect AEMO’s new role.

1.2.4 Inherent limitations and qualifications

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 electricity 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 System Management’s compliance with the Electricity Rules and Market Procedures is therefore subject to the following caveats:

1. 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, in the event that we were to detect any fraudulent or illegal activity, we would report this to AEMO or System Management. No such findings have been made during this audit.
2. 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. Specifically, our business process reviews assessing the use of controls were undertaken after the end of the audit period. As such:
 - a. Although our findings are indicative of System Management’s practices during the audit period, they do not constitute definitive evidence that System Management applied those controls during the audit period.
 - b. Projections of our findings to future periods carry the risk that:
 - i. Controls may become inadequate over time due to changes in the Electricity Rules or System Management’s business processes, procedures and systems
 - ii. Degree of compliance with the control procedures we have reviewed deteriorate over time.
 - iii. Effectiveness of or requirements for controls change due to significant changes to systems or staffing. Particularly, the transfer of system operations functions to AEMO

means that that there will be new recruits performing complex tasks (implementing material obligations) with limited process documentation in place. Therefore, our opinion cannot be used as an indicator of future compliance in the risk areas we have noted in our findings.

- c. As in previous year, we have noted a lack of audit trail in a number of areas, including control room operations. As a result we have been unable to form a definitive with respect to System Management obligations relating to dispatch of Synergy facilities under Chapter 7 and System Management's load forecasting obligations under Chapter 7A. We therefore provide a qualified opinion in these areas. Please see respective chapters for more details.

1.3 Structure of this report

The remainder of this report is structured based on the chapters of the Electricity Rules and includes:

- A brief summary of rule chapter contents.
- Commentary on whether System Management's procedures (Electricity Procedures and Internal Procedures) have been updated to reflected amendments to the Electricity Rules during the audit period. Changes beyond the end of the audit period are not included.
- Commentary on System Management's operational compliance and areas of compliance risk (where relevant).

Unless otherwise specified, all references to the Electricity Rules refer to the most recently applicable rules as at the end of the audit period (i.e. the Electricity Rules as at 1 June 2016).

2 ELECTRICITY RULES CHAPTER 1 – INTRODUCTION

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

2.1 System Management processes and procedures

2.1.1 Amendments to System Management obligations since last audit

There have been only transitional amendments to System Management's obligations under Chapter 1. Amendments relate to AEMO's adoption of functions previously undertaken by the IMO.

2.1.2 Amendments to Electricity Procedures and Internal Procedures

There are neither Power System Operation Procedure sections nor internal procedures relevant to Chapter 1.

2.2 Compliance with Chapter 1

We have not conducted any audit procedures to assess System Management's compliance with Chapter 1 of the Electricity Rules.

There have been no self-reported or IMO/AEMO alleged instances of System Management non-compliance with Chapter 1.

3 ELECTRICITY RULES CHAPTER 2 – ADMINISTRATION

Chapter 2 of the Electricity Rules sets out obligations relating to Functions and Governance; Market Documents; Monitoring, Enforcement and Audit; Reviewable Decisions and Disputes; Market Consultation; Budgets and Fees; Maximum and Minimum Prices and Loss Factors; Participation and Registration; Communications and Systems Requirements; Prudential Requirements and Emergency Powers.

3.1 System Management's processes and procedures

3.1.1 Amendments to System Management obligations since last audit

There have been only transitional amendments to System Management's obligations under Chapter 2. Amendments relate to AEMO's adoption of functions previously undertaken by the IMO.

3.1.2 Procedures

There have been no amendments to the Power System Operation Procedure or to System Management's Internal Procedures relating to Chapter 2 of the Electricity Rules since last year's market audit.

3.2 Compliance with Chapter 2

We have not conducted any audit procedures to assess System Management's compliance with Chapter 2 of the Electricity Rules.

There have been no self-reported or IMO/AEMO alleged instances of System Management non-compliance with Chapter 2.

4 ELECTRICITY RULES CHAPTER 3 – POWER SYSTEM SECURITY AND RELIABILITY

Chapter 3 of the Electricity Rules sets out obligations relating to Power System Security and Reliability; Ancillary Services; Medium and Short Term Planning; Commissioning Tests; Decommithment and Reserve Capacity Obligations; and Settlement Data relating to power system operation.

4.1 System Management's processes and procedures

4.1.1 Rule amendments

There has been a combination of minor cosmetic amendments (e.g. changes to clause wording to enhance clarity) and transitional amendments to Chapter 3 since last year's market audit. Transitional amendments relate to AEMO's adoption of functions previously undertaken by the IMO.

4.1.2 Procedures

There have been no amendments to the Power System Operation Procedure or to System Management's Internal Procedures relating to Chapter 3 of the Electricity Rules since last year's market audit.

4.2 Compliance with Chapter 3

4.2.1 Audit Activities

We have undertaken compliance testing and business process walkthroughs in the following functional areas relating to Chapter 3 of the Electricity Rules:

- Preparation of the ST PASA report under Section 3.17 of the Electricity Rules (we did not review the preparation of the Metrix forecast that is an input to the ST PASA report)
- Approval of scheduled generator outages under Section 3.18 of the Electricity Rules.
- Approval of Commissioning Test requests under Section 3.21A of the Electricity Rules
- Declaration of High Risk and Emergency Operating States under Sections 3.4 and 3.5 (respectively) of the Electricity Rules.

We have also reviewed self-reported and AEMO/IMO alleged instances of System Management non-compliance with Chapter 3.

4.2.2 Audit Findings

Table 8 summarises audit findings by compliance rating and risk rating.

Table 9 provides details of audit findings that were classified as Compliance Rating 1 (i.e. incidents of non-compliance with Chapter 3 of the Electricity Rules).

Table 10 provides details of audit findings that were classified as Compliance Rating 2 and 3.

Table 8: Summary of audit findings classified by compliance and risk ratings

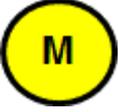
Risk rating	Compliance rating		
	1	2	3
		1	
	2	1	
	2		1

Table 9: Summary of Compliance Rating 1 Audit Findings (i.e. incidents of non-compliance with Chapter 3 of the Electricity Rules).

Electricity Rules clause	Risk Rating	Description
<p>3.18.11(a), 3.18.11(aA), 3.19.6(a)</p> <p>(Multiple breaches)</p>		<p>Clauses 3.18.11(a) and 3.18.111A requires System Management to take into account a reasonable estimate of available DSM when approving outages. When approving outages, System Management does not take available DSM into account (assuming zero availability). This is due to the complications arising as a result of constraints around DSM availability (for example, DSM would typically only be dispatched in summer; additionally there are constraints around maximum number of hours, maximum number of consecutive calls, calls per day, etc.). Most facilities schedule long-duration outages (under Section 3.18 of the Electricity Rules) in the off-peak/shoulder months. During this time the omission of DSM as part of the outage approval process will not impact on outage decisions, as DSM are unlikely to be called on during off-peak months. Therefore, this breach is unlikely to have negligible impact on market outcomes.</p>
<p>3.19.3A(b)</p>		<p>Under this rule, System Management must not approve Opportunistic Maintenance for a facility on two consecutive Trading Days. On 15 June 2016, a facility rang up the control room requesting On the Day Opportunistic Maintenance (ODOM). However, this facility had already been granted ODOM the day before. ODOM requests and approvals are logged manually in the control room operator's shift log; in this instance the previous ODOM request had been granted by a previous operator whose log sheet was not available to the on-shift operator. As a result, the on-shift operator did not realise the facility had already been on outage the day before and granted the ODOM request. Due to the manual nature of processing ODOM in the control room and the fact that there are no preventive controls in place, it is possible that this breach will recur. However, the impact of such a breach is likely to be immaterial as the operator would not allow an outage to proceed if it violated the security requirements set out in Chapter 3 of the Electricity Rules. However, we do note that there is a possibility that participants may deliberately request ODOM on two consecutive days to avoid exposure to the reserve capacity refunds (which they would be forced to pay if they were on forced outage). Under clause 3.19.3A(c) of the Electricity Rules, System Management must not approve an outage request made principally to avoid exposure to reserve capacity refunds. However, System Management currently has no process (or means) to make this determination (please see our related finding in Table 10).</p>
<p>3.21.6(b)</p>		<p>Clause 3.21.6(b) requires System Management to convert forced outage amounts to a sent out basis at 41 degrees Celsius; the formula is a function of the Reserve Capacity Obligation Quantity (RCOQ) of the relevant facility. Clause 4.12.3(aA) further states that the Reserve Capacity Obligation quantity for intermittent generators is zero. For trading dates 14 May 2016 and 15 May 2016 System Management calculated (and provided to AEMO) an incorrect converted forced outage amount for an intermittent generator (failing to note that the facility RCOQ was zero under clause 4.12.3(aA)). System Management therefore reported a non-zero forced outage value for the facility (when the value should have been zero). AEMO uses this forced outage value to reduce the maximum quantity a participant can offer into the STEM. The error was noted by AEMO staff (on 13 May 2016) who notified System Management. However, System Management were unable to provide corrected data before the STEM submission deadline (at 8:30am on 13 May 2016).</p>

Electricity Rules clause	Risk Rating	Description
		<p>The conversion process is manual and in this instance, System Management staff overlooked the conversion process (and reported the raw ex-ante outage value). System Management has advised that they have logged an IT service issue requesting automation of systems to convert intermittent generator outages zero RCOQs¹¹.</p> <p>This breach had no market impact as the participant does not trade in the STEM (and as the affected facility was an intermittent generator, it is unlikely they would submit into the STEM).</p> <p>If, however, the affected facility were a scheduled generator, then System Management's error may have restricted the facility's ability to participate in the STEM.</p>
<p>3.22.3</p> <p>See also related breach of 9.20.5(c)(ii) in Chapter 12.</p>		<p>Clause 3.22.3 requires System Management to provide AEMO (previously IMO) with financial details of Ancillary Services contracts for a given Trading Month. On 16 May 2015, System Management provided AEMO erroneous information with respect to a market participant for the April Trading Month (as a result of a manual error). The participant subsequently raised a disagreement with the IMO (as the error had resulted in an incorrect payment to the participant).</p> <p>System Management was subsequently required to submit, under clause 9.20.5(c)(ii) a revised value to rectify the previous error. The revised value provided by System Management (on 6 July 2015) was also incorrect. See related breach in Chapter 12.</p> <p>The manual nature of compiling the ancillary services information means that error may occur from time to time (we noted a breach of the same rule during last year's audit as well). In this case, the breach resulted in a market participant being paid an incorrect settlement amount twice (once during the initial settlement (discrepancy of \$55,812.92) and again during the first adjustment (discrepancy of \$72,365.91)). AEMO subsequently rectified this error in the second adjustment.</p>

Table 10: Summary of Compliance Rating 2 & 3 Audit Findings (Chapter 3)

Finding	Compliance & Risk Rating	Description
Lack of internal procedures (or business process documentation) poses compliance risk in light of departing System Operations & Power Engineers (SOPE) and transition of system operator role to AEMO	 	As noted in previous years, many of System Management's business processes are undocumented. This includes obligations under Chapter 3 such as outage planning and approval, process for setting ancillary services requirements, commissioning tests and power system security obligations (regarding the latter, see related finding in Chapter 8 on Control Room Instructions and dispatch procedures). As further noted in previous years, network outage scheduling and approval is undertaken by Western Power staff (as System Management has delegated these functions to Western Power due to resourcing issue) and is likewise undocumented.

¹¹ The IT issue remains open and is ongoing.

Finding	Compliance & Risk Rating	Description
		<p>With the impending transfer of System Management functions to AEMO and the departure of most SOPEs, we note that this lack of procedural documentation poses significant risk of non-compliance if new recruits will be carrying out obligations in the functional areas described above.</p> <p>We recommend that processes in the above areas be immediately documented.</p>
<p>Manual process to include transmission outages and potential constraints for ST PASA report (under clause 3.17.9(f)) poses risks of omission and errors.</p>		<p>Clause 3.17.9(f) of the Electricity Rules requires System Management to include information about transmission outages and potential constraints in the ST PASA report. System Management retrieves outages from their SMITTS and manually checks them against the Equipment List (as Western Power uses different labels to identify transmission equipment). During our process walkthrough we noted that Western Power's identification of generators affected by transmission outages is ad-hoc (and may not reflect potential consequential outages).</p> <p>System Management is dependent on the integrity of information provided by participants. Furthermore, the manual processing of transmission outages has some risk of omissions and errors.</p> <p>We recommend equipment labelling be made consistent across different System Management systems to avoid potential omissions and to enhance the efficiency of the ST PASA process.</p>
<p>System Management has no process to determine whether a participant has lodged an outage request to avoid exposure to paying reserve capacity refunds (as required under clause 3.19.3A(c)).</p>		<p>Under clause 3.19.3A(c) of the Electricity Rules, System Management must not approve an outage request made principally to avoid exposure to reserve capacity refunds. Since market start, System Management has had no process to make this determination. With AEMO adopting the system operator role, and in light of AEMO staff's greater knowledge and understanding of the Reserve Capacity Mechanism, we recommend AEMO establish a process to meet its obligations under this clause.</p>

5 ELECTRICITY RULES CHAPTER 4 – RESERVE CAPACITY

Chapter 4 of the Electricity Rules sets out the Reserve Capacity Rules, including: Expressions of Interest; LT PASA; Certification of Capacity; Auctions and Bilateral Trades; Capacity Credits; Special Price Arrangements; Shortages of Reserve Capacity; Testing, Monitoring and Compliance; Funding; Capacity Refunds; Early Certification; and Settlement Data.

5.1 System Management’s processes and procedures

5.1.1 Amendments to System Management obligations since last audit

There have been only transitional amendments to System Management’s obligations under Chapter 4. Amendments relate to AEMO’s adoption of functions previously undertaken by the IMO.

5.1.2 Procedures

There have been no amendments to the Power System Operation Procedure or to System Management’s Internal Procedures relating to Chapter 4 of the Electricity Rules since last year’s market audit.

5.2 Compliance with Chapter 4

We have not conducted any audit procedures to assess System Management’s compliance with Chapter 4 of the Electricity Rules.

There have been no self-reported or IMO/AEMO alleged instances of System Management non-compliance with Chapter 4.

6 ELECTRICITY RULES CHAPTER 5 – NETWORK CONTROL SERVICES

Chapter 5 of the Electricity Rules sets out obligations relating to Network Control Services, including the process, and settlement data requirements.

There are currently no Network Control Service contracts in operation in the WEM.

6.1 System Management's processes and procedures

6.1.1 Amendments to System Management obligations since last audit

There have been only transitional amendments to System Management's obligations under Chapter 5. Amendments relate to AEMO's adoption of functions previously undertaken by the IMO.

6.1.2 Procedures

System Management has no procedures relating to Chapter 5 of the Electricity Rules.

6.2 Compliance with Chapter 5

We have not conducted any audit procedures to assess System Management's compliance with Chapter 5 of the Electricity Rules as there are no network control service contracts registered in the WEM.

7 ELECTRICITY RULES CHAPTER 6 – ENERGY MARKET

Chapter 6 of the Electricity Rules sets out obligations relating to the Energy Scheduling Timetable and Process; the Short Term Energy Market; Non-Balancing Dispatch Merit Orders; Balancing Prices and Quantities; Market Advisories and Energy Price Limits; and Settlement Data.

7.1 System Management's processes and procedures

7.1.1 Rule amendments

There have been no amendments to Chapter 6 since last year's market audit:

7.1.2 Procedures

System Management has limited obligations under Chapter 6. There are no Power System Operation Procedure sections.

There have been no amendments to System Management's Internal Procedures relating to Chapter 6 of the Electricity Rules since last year's market audit.

7.2 Compliance with Chapter 6

We have not conducted any audit procedures to assess System Management's compliance with Chapter 6 of the Electricity Rules.

There have been no self-reported or IMO/AEMO alleged instances of System Management non-compliance with Chapter 6.

8 ELECTRICITY RULES CHAPTER 7 – DISPATCH

Chapter 7 of the Electricity Rules sets out obligations relating to the dispatch process, including: non-balancing dispatch; dispatch compliance; advisories, balancing suspension and reporting; and settlement and monitoring data relating to dispatch.

8.1 System Management's processes and procedures

8.1.1 Rule amendments

There have been only transitional amendments to System Management's obligations under Chapter 7. Amendments relate to AEMO's adoption of functions previously undertaken by the IMO.

8.1.2 Procedures

There have been no amendments to the Power System Operation Procedure or to System Management's Internal Procedures relating to Chapter 7 of the Electricity Rules since last year's market audit.

8.2 Compliance with Chapter 7

8.2.1 Audit Activities

We have undertaken compliance testing and business process walkthroughs in the following functional areas relating to Chapter 7 of the Electricity Rules:

- Dispatch scheduling. We have reviewed outputs of System Management's Real-Time-Dispatch-Engine (RTDE) for selected intervals during the audit period against system inputs (such as the BMO, RTDE constraints, load forecasts, etc.) to determine whether RTDE is producing results that are compliant with Section 7.6 (Dispatch Criteria) of the Electricity Rules.
- Control room operations. We have shadowed System Management staff to review how Section 7.6 is applied in practice (as well as LFAS obligations under Chapter 7B and power system security obligations under Chapter 3).
- Synergy dispatch planning under Section 7.6A of the Electricity Rules.
- Dispatch advisories. We reviewed the timeliness and content of all dispatch advisories:
 - Relating to High Risk or Emergency Operating States
 - Sent out more than 10 hours after the relevant incident commenced.
- Preparation and transmission of settlement information to AEMO under clause 7.13.1 of the Electricity Rules.

We have also reviewed self-reported and AEMO/IMO alleged instances of System Management non-compliance with Chapter 7.

8.2.2 Audit Findings

Table 11 summarises audit findings by compliance rating and risk rating.

Table 12 provides details of audit findings that were classified as Compliance Rating 1 (i.e. incidents of non-compliance with Chapter 7 of the Electricity Rules).

Table 13 provides details of audit findings that were classified as Compliance Rating 2 and 3.

Table 11: Summary of audit findings classified by compliance and risk ratings

Risk rating	Compliance rating		
	1	2	3
	1	2	0
	6	5	0
	7	2	0

Table 12: Summary of Compliance Rating 1 Audit Findings (i.e. incidents of non-compliance with Chapter 7 of the Electricity Rules).

Electricity Rules clause	Risk Rating	Description
7.4.2, 7.5.2 (multiple breaches)		<p>Clauses 7.4.2 and MR 7.5.2 require System Management to acknowledge receipt of Dispatch Merit Orders, Fuel Declarations and Resource Plans (for a Trading Day) within 5 minutes of receiving said files from AEMO. A self-review initiated by System Management found that receipt acknowledgements were sent a few minutes late in nine instances for MR 7.4.2 and seven instances for MR 7.5.2.</p> <p>The acknowledgement receipt process is manual and is subject to delay from time to time.</p> <p>We note, however, that a breach of this clause has no underlying risk associated with it and failure on the part of SM to acknowledge receipt has no impact on AEMO activities. Furthermore, these clauses were, as of 1 July 2016, deleted.</p>
7.6A.2(c)		<p>Clause 7.6A.2(c) requires System Management to provide Synergy, by 4:00pm on the Scheduling Day associated with a Trading Day, information associated with Synergy's dispatch plan. On 13 March 2016 System Management provided Synergy with the Dispatch Plan and Forecast Fuel Requirements for 14 March three hours late at 7:43pm. The process used to derive, collate and transmit Synergy's dispatch plan is manual and prone to human error and oversight. In this instance, the operator on duty forgot to transmit the file that was prepared earlier in the day. However, the dispatch plan is sent the Synergy three times each day (in the morning, in the afternoon and in the evening). The evening files contain the most accurate forecast as it used BMO data (whereas the 4pm forecasts use Resource Plan data). The impact of this breach is therefore immaterial, as Synergy received the third (most accurate) forecast on time.</p>
7.6.A2(e) (Two breaches)		<p>Under clause 7.6A.2(e) System Management must provide to AEMO (previously the IMO) by 4:00pm on the Scheduling Day associated with a Trading Day the aggregate forecast output of all Non-Scheduled Generators (NSG) for the Trading Day, referred to in clause 7.6A.2(c)(1)(2). System Management breached this clause twice during the audit period (on 29 October 2015 and 9 June 2016). On both occasions, as a result of oversight, System Management sent the NON-SCHEDULED_SYSTEM_GENERATION_FORECAST.xml file to IMO/AEMO approximately one hour late. Given the manual nature of this process such oversights are likely to occur from time to time. We note that the NSG forecast provided to AEMO under this rule is used for informational purposes only and is not an input into the BMO. Therefore, the impact of this breach is immaterial.</p>
7.6.1C, 7.6.1D		<p>Clauses 7.61C and 7.6.1D set out the Dispatch Criteria and the rules around out of merit dispatch. On 23rd of November 2015, due to an IT systems issue, System Management was unable to load the latest BMOs from the IMO to its systems. The issue started at midnight and was not resolved till 6:30 a.m. During this time, System Management continued to dispatch in accordance with the last loaded BMO. As this issue occurred in the early hours of the morning (when generation and load is flat) the system impact was minor. Only one facility was dispatched out of merit (synchronising at 7:01 a.m. instead of 6:30 a.m.). This out of merit dispatch was a breach of Clauses 7.6.1C and 7.6.1D of the Electricity Rules and resulted in a constraint payment to a participant who would have otherwise not received one.</p>

Electricity Rules clause	Risk Rating	Description
		<p>We further note that three similar IT systems incidents have recurred outside the audit period on the 22 July, 26 July and 3 August¹². These incidents are still being investigated but are likely to have resulted in multiple breaches of the dispatch criteria (Section 7.6C of the Electricity Rules). We further note AEMO plans to undertake a due diligence on System Management’s market systems to better understand the level of risk.</p> <p>Given the recurrence of this issue and the potential financial impact on multiple participants, we have deemed this to be a significant audit finding.</p>
7.7.6 (multiple breaches)		<p>Clause 7.7.6 of MR requires System Management to issue an Operating Instruction (OI) to market participants when providing instructions pertaining to ancillary services, commissioning tests or reserve capacity tests. On multiple instances between 1 and 13 October 2016, System Management issued commissioning test Operating Instructions to the operator of the relevant facility (who was listed as the contact on the commissioning test plan), instead of the market participant associated with the facility. System Management has revised its communication protocol with respect to Operating Instructions to prevent further similar breaches. We note that this breach had no market impact.</p>
7.11.3 (eight breaches)		<p>Clause 7.11.3 requires System Management to send out Dispatch Advisories (in accordance with clause 7.11.5) as soon as practicable after System Management becomes aware of the relevant event. In the sample we have tested, we have noted eight instances in which System Management sent out Dispatch advisories over an hour late. These includes DA # 16402, 11377, 14967, 15478, 15606, 15603, 15824 and 16385.</p> <p>With the exception of #16402 (this was an out of merit dispatch advisory issued under clause 7.11.5(g) and was issued over 10 hours late) , all other breaches pertained to High Risk Operating State events. As such, it is important for System Management to release such advisories promptly. We further note that these dispatch advisories were issued late as the events occurred outside of business hours and there was no market operations staff on site to prepare and transmit the advisory.</p>
7.11.5(g)		<p>Clause 7.11.5(g) requires System Management to release a Dispatch Advisory in the event it expects to dispatch a facility out of merit (in accordance with Section 7.6A of the Electricity Rules). On the 28 January 2016 System Management dispatched a facility out of merit (constraining its output downward from 16:42 to 19:50) to avert a system security issue. However, System Management failed to release a Dispatch Advisory under clause 7.11.5(g). This is a recurring breach that we have noted in previous years – see our related finding in Table 13. The manual process associated with the Dispatch Advisory process combined with the low level of staffing in the control room means that this type of breach will likely recur. This type of breach impacts on market transparency and decision making by participants (who may choose to revise offers based on the latest dispatch information).</p>

¹² In the event that such an issue recurs (within business hours), a possible mitigation measure is for System Management to print out the Balancing Merit Orders and manually input the information into the Real Time Dispatch Engine (RTDE). However, such a process would be subject to input error. We further note that after business hours, there would be no market operations staff to perform this manual role.

Electricity Rules clause	Risk Rating	Description
7.11.6(DA)		<p>Clause 7.11.6(DA) requires System Management to include information about the location and quantity of out of merit dispatch for Dispatch Advisories issued under clause 7.11.5(g). On 7 January System Management issued a Dispatch Advisory (DA 15610) stating two facilities had been dispatched out of merit. However, no quantities were provided.</p> <p>This is a recurring issue that we have noted in previous audits that we have noted can be addressed by publishing the latest dispatch schedule to market participants. As noted in our previous audit reports, the absence of information on out of merit dispatch advisories can compromise efficient bidding decisions by market participants (see our related finding in Table 13).</p>
7.12. Status Reports		<p>Clause 7.12.1 requires System Management to provide a report to the ERA (previously to the IMO) once every three months on the performance of the market with respect to the Dispatch process. The 7.12.1 Status Report for the third quarter of 2015 was submitted a week late due to an oversight. This status report is for informational purposes only and the delay would not have impacted market outcomes.</p>
7.13.1A(b)		<p>Clause 7.13.1A(b) requires System Management to provide AEMO (previously the IMO), by 12:00 PM on the fifteenth Business Day following a Trading Day, with a schedule of all Planned Outages, Forced Outages and Consequential Outages relating to each Trading Interval in the Trading Day by Market Participant and Facility. System Management breached this clause when it did not provide the Forced Outage values for a particular facility on Trading Day 2 April 2015. The omission was caused as a result of the relevant facility retiring on 2 April 2015, and due to the fact that SM systems used a definition of calendar date (as opposed to Trading Day) to determine outages. Hence, System Management's systems determined that the facility had 0MW of Capacity Credits from midnight (2 April 2016) instead of from 8am (2 April 2016).</p> <p>As a result of this breach, the affected participant did not pay the correct reserve capacity refund (\$61,000) during initial settlement; however, this was rectified in the first adjustment.</p> <p>As noted above, this breach occurred as a result of System Management's systems defining "trading day" inconsistently with the Electricity Rules definition. We therefore note that this breach may recur given the expected retirement of approximately 300MW of Synergy generation by late 2017. System Management has stated that they have plans to implement a manual workaround to address this issue. We recommend that System Management updates its procedures to reflect this manual workaround¹³.</p>
7.13.1(cA)		<p>Clause 7.13.1(cA) requires System Management to provide AEMO (previously the IMO) by noon on the first Business Day following the day on which the Trading Day ends, a schedule of the MWh output of each generating system monitored by System Management's SCADA system for each Trading Interval of the Trading Day (i.e. the sent-out energy for each facility). On 6 November 2015, System Management breached clause 7.13.1(cA) when it provided the facility SCADA information for Trading Day 5 November 2015 which contained an incorrect value for a particular facility during a single interval. The error was caused by a SCADA issue which meant that data for the relevant facility was missing (or 0 MWh) for a single interval. System Management staff validate SCADA data on a daily basis to check for such errors. However, due to an oversight, this error was not picked up. In this particular instance there was no financial impact (but recurrence of this breach can potentially cause financial errors).</p>

¹³ As at the time of the audit, we have not seen any procedures to this effect.

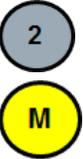
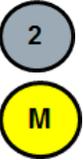
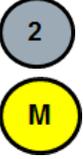
Electricity Rules clause	Risk Rating	Description
		The manual nature of the SCADA cleansing process means that from time to time errors may occur due to similar oversights.
7.13.1(eE)		<p>Clause 7.13.1(eE) requires System Management to send to AEMO details of fuel change notifications that participants have provided System Management under clause 7.5.4. System Management provides this data to AEMO in the daily DISPATCH_VOLUMES file which includes a fuel type variable (which should reflect any changes participants have notified under clause 7.5.4).</p> <p>On 15 February 2016, as result of human error, System Management provided a DISPATCH_VOLUMES file that included an incorrect fuel type for a particular facility (on a Reserve Capacity Test). System Management provided corrected data for this facility on 18 February 2016. Note that there would have been no impact on settlement outcomes even if the fuel indicator had been incorrect (all other aspects of the DISPATCH_VOLUMES file was correct). Therefore the impact of this breach is immaterial.</p>
7.13.1(eF)		<p>Clause 7.13.1(eF) requires System Management to send to AEMO the maximum quantity of sent out energy in MWh which each Non-Scheduled Generator, by Trading Interval, would have generated in the Trading Interval had a Dispatch Instruction not been issued, as determined in accordance with clause 7.7.5B. System Management provided AEMO with erroneous data (under this clause) for a particular facility for trade dates 21 May 2016 and 22 May 2016 for selected intervals. System Management provided revised (corrected) data to AEMO on 1 June 2016. The error was caused as a result of SCADA data dropping out during the relevant intervals. System Management has a validation process to detect such anomalies (which PA has sighted). In this instance, due to an oversight, the missing data was not detected. In this instance, the breach did not have a financial impact (as System Management provided a corrected value before settlement deadlines). If settlement deadlines had been missed, then this may have resulted in an incorrect constraint payment being paid to the affected participant.</p> <p>Given the manual nature of the SCADA cleansing/validation process similar oversights could occur. Further, given the potential impact on constraint payments, we have noted this breach as a medium risk finding.</p>
7.13.1(h)		<p>Clause 7.13.1(h) requires System Management to provide a Dispatch Volume file to AEMO (previously IMO) that identifies all facilities undergoing a Commissioning Test. On 2 September 2015, System Management sent the IMO the Dispatch Volumes file for Trading Day 3 June 2015, but failed to include a facility that had been undergoing a Commissioning Test. The oversight was due to a misunderstanding on the part of System Management. The relevant facility had emailed System Management on the evening prior to the Trading Day advising that it did not plan to proceed with part of the test. System Management interpreted this as a cancellation notification and therefore cancelled the entire test but did not inform the participant. The participant subsequently conducted the test, but as System Management had cancelled it on their records, they did not include it on the list of commissioning tests to be sent to the IMO.</p> <p>As a result of this breach, the affected participant was erroneously charged a Net STEM shortfall refund amount of \$34,317.74. However, this was rectified in subsequent adjustments.</p> <p>To prevent the recurrence of this issue, System Management have advised that in future cancellations will be communicated explicitly to the participant in question. However, we have not noted any procedural updates to this effect.</p>

Table 13: Summary of Compliance Rating 2 & 3 Audit Findings (Chapter 7)

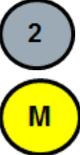
Finding	Compliance & Risk Rating	Description
<p>Upcoming departure of experienced control room operators poses significant risk to power system security and market dispatch obligations (particularly in light of patchy process documentation in this area)</p>		<p>We understand that none of the experienced Western Power (System Management) control room operators have accepted AEMO's offer with respect to the transfer of system operations functions to AEMO.</p> <p>We further understand that AEMO is in the process of recruiting new control room operators and is currently developing a competency based training plan for these new recruits.</p> <p>There are plans to extend the System Management control room operator contracts to at least April 2017 (and potentially to October 2017) to facilitate succession planning.</p> <p>Nevertheless, we note there is significant risk associated with placing new recruits without previous power system operations experience in the control room with only a few months of training (including simulation training). This risk is even more severe during bush-fire season (January – February) when there are often multiple instances of High Risk and Emergency Operating State declarations. For example, if the experienced controllers all depart in 2017, then the new recruits will have to manage the control room without veteran experience during the 2018 bush fire season. As above, we note significant risk in this respect.</p> <p>We further note that there is still no documented process documentation relating to control room operations (significant work has been done updating Control Room Instructions (CRIs); however, these are facility specific documents and have not as yet formally approved. There are, as yet no high level documents outlining the dispatch process and other aspects of control room operations¹⁴).</p> <ul style="list-style-type: none"> •
<p>Level of staffing in control room poses risk to security and dispatch obligations</p>		<p>We reiterate our findings from previous years that the low staffing levels in the control room pose significant compliance risk (there is only one controller on shift (with two shifts per day)). This practice is not consistent with the practice of comparable system operators internationally. Specifically:</p> <ul style="list-style-type: none"> • In high-risk or emergency situations it can be challenging for a single controller to handle both security and dispatch creating scope for non-compliance. Such scenarios are likely to arise during summer peak intervals and carry with them high risk of dispatch non-compliance and/or non-compliance with power system security obligations. • The timeliness issues around dispatch advisories is related, in part, to a single controller being on shift. The controller may be too occupied with security and dispatch issues to notify market operations staff of the need to issue an advisory. • In the event that a controller becomes incapable carrying out their duties (e.g. due to sickness or other unforeseen circumstances), the control desk may remain unattended until a replacement controller arrives to take over the shift¹⁵.

¹⁴ System Management have had plans to develop such documentation for at least the last three years, but we are yet to note any progress in this area

¹⁵ In the interim network operators may be able to provide some level of coverage until a replacement controller arrived. However, this interim relief would depend on the network operator's skillset; in particular the network operator would need system operations experience which is not the same as network operations experience.

Finding	Compliance & Risk Rating	Description
		We note that System Management has, in its recent allowable revenue submission, requested budget for a security controller in the control room. As at the time of the audit, however, there was no change to the level of resourcing in the control room.
The processes around the issuance of Dispatch Advisories continues to pose risk of breaches with Section 7.11 of the Electricity Rules.		<p>This year we have, again, noted breaches relating to the timeliness and content of Dispatch Advisories. This is a recurring theme from past audits. The breaches are a result of:</p> <ul style="list-style-type: none"> • A manual process for issuing advisories. • Inability of market operations staff to remotely access the dispatch advisory system after hours (control room operators assert that they cannot both conduct dispatch/security activities and release advisories). <p>The vast majority of information is relayed without incident. However, as indicated above, the current dispatch advisory mechanism may not be the most efficient way to provide the necessary information to the market¹⁶; as a result, there are often instances when Dispatch Advisories are sent out late or without the information required under the rules (including information about the location and quantity of out-of-merit dispatch¹⁷).</p> <p>Delays or failures in notifying market participants of out-of-merit dispatch, significant outages, or other significant events compromise market transparency and can compromise efficient decision making by participants.</p> <p>We note that none of our previous audit findings in this area have been addressed. As such, we reiterate this audit finding.</p>
The lack of procedural documentation and upcoming departure of SOPEs may mean potential future breaches of Section 7.6A of the Electricity Rules.		<p>As noted in our previous audits, there is no process documentation relating to the Synergy Dispatch Planning process (under Section 7.6A of the Electricity Rules). This is a manual process that requires good knowledge of the capabilities of different Synergy plant.</p> <p>With the imminent departure of all but one experienced SOPE, we note that the absence of process documentation in this manual process means it is likely there will be errors and breaches in this area in the future. However, as noted below, the Synergy Dispatch plan is a nominal estimate used by Synergy for fuel planning. Therefore, errors or breaches in this area are likely to have minor impacts only. To mitigate this risk we recommend finalising and approving process documentation in this area to support newly recruited SOPEs.</p>
There is room to better align the dispatch process with market objectives around economic efficiency		<p>During our control room walkthrough we noted two practices that may compromise economically efficient market outcomes:</p> <ul style="list-style-type: none"> • System Management controllers using Synergy plant to manage LFAS position instead of the marginal plant. Although this may be considered “Dispatch Support Services”, when there is large movement in load during the interval, rerunning RTDE (with an updated load forecast) would lead to a more economically efficient outcome. In this sense, rerunning RTDE more frequently during the trading interval (e.g. once every five minutes; at the moment RTDE is run three times during the interval) would yield a more efficient outcome.

¹⁷ We have previously recommended that dispatch schedules be published to market participants every time RTDE is rerun using new information (e.g. new forecasts, new constraints, etc.).

Finding	Compliance & Risk Rating	Description
		<ul style="list-style-type: none"> Constraints are manually entered into RTDE and remain in place until the issue has been resolved. Sometimes constraints can remain on for hours. This means that if participants change their offers to avoid being constrained on or off, this change in bidding will not be reflected in market outcomes (as System Management does not conduct a security constrained economic dispatch each interval). This may lead to potential breaches of Section 7.6.1C and 7.6.1D of the Electricity Rules (e.g. if a more expensive plant remains constrained on or a cheaper plant remains constrained off). <p>We understand that the low level of staffing in the control room is a contributing factor to the above practices. However, with the proposed increase in control room staffing (as per System Management's recent allowable revenue submission) we recommend AEMO consider applying 5 minute dispatch and inter-interval security constrained dispatch to address the issues above.</p>
<p>The manual nature of settlement data preparation and transmission (under clause 7.13.1 of the Electricity Rules) means that breaches and errors may occur from time to time</p>		<p>We have noted multiple breaches of clause 7.13.1 of the Electricity Rules during this market audit. Clause 7.13.1 sets out System Management's obligations with respect to preparing settlement data (to be used by AEMO). The majority of the processes used to implement these obligations are manual (but well-documented in internal procedures). Given the manual nature of the processes, it is inevitable that from time to time errors and oversights will occur.</p> <p>To mitigate future breaches and errors we recommend System Management be diligent in validating settlement data prepared under clause 7.13.1, and investigate the potential for automation of these tasks.</p>
<p>Communication protocols between Western Power and AEMO will be required to ensure seamless application of network constraints in dispatch</p>		<p>As noted in previous audits, security assessments used by the controller to place security constraints in RTDE are undertaken by Western Power Network Operations staff (as the single controller cannot both dispatch and undertake the security assessment, particularly during high risk/emergency situations). Likewise, the network aspects of system monitoring required to monitor the system state as defined in clauses 3.3.1, 3.4.1 and 3.5.1 (e.g. overloading of transmission lines, voltage issues, circuit issues) are undertaken by Network Operations staff (who then notify the controller).</p> <p>As System Management is currently co-located with Western Power Network Operations staff these security related processes can be undertaken with ease. However, we note System Management will be transferring to new premises in late 2017. When this happens, it will be important for there to be communication protocols in place to ensure network security constraints and network security status is communicated to System Management staff in a timely and efficient manner.</p>
<p>System Management's dispatch decisions around Synergy plant are opaque - there is potential for breaches of Clauses 7.6.2 and 7.13.1(a)</p>		<p>Clause 7.6.2 requires System Management to dispatch the Synergy Portfolio either under a Dispatch Plan or a Dispatch Order (the former notifying a deviation from a Dispatch Plan). Clause 7.13.1 requires System Management to send Dispatch Orders to AEMO.</p> <p>System Management prepares a Dispatch Plan under clause 7.6A.2 on the Scheduling Day which it sends to Synergy (which includes low, mean and high bounds for all portfolio facilities). In practice, however, this Dispatch Plan's primary purpose is to assist Synergy with its gas nomination. During real-time operations, the controller may vary individual Synergy facilities as they deem necessary to maintain power system security requirements. In effect, this means that the Dispatch Plan prepared on the Scheduling Day may not be, in practice, a reflection of System Management's real-time dispatch decisions. Additionally, System Management does not issue electronic Dispatch Orders to Synergy facilities; relying instead</p>

Finding	Compliance & Risk Rating	Description
		<p>on AGC or the telephone, meaning the Synergy dispatch audit trail is intractable. Due to the lack of audit trail it is difficult to definitively state whether or not System Management has breached Clause 7.6.2 (or 7.13.1 as a result of not sending Dispatch Orders to AEMO when there has been a deviation from the Dispatch Plan), as System Management alleges that Synergy facilities are typically dispatched between the high and low bounds of the Dispatch Plan. However, we have in the past (during our site visits), noted that this is not always the case. It is also, unlikely that System Management would never depart from the high and low bounds of the Dispatch Plan which is based on forecasts that may not always reflect real-time conditions.</p> <p>Although we are not alleging a breach, we reiterate our past findings that the approach adopted to dispatching Synergy is opaque and runs counter to market transparency objectives. We also note the lack of proper governance around processes (specifically around audit trails) is a recurring issue in multiple areas such as control room operations and planning.</p>
<p>There is opportunity to improve the audit trail of control room operations</p>	<p>2 L</p>	<p>The level of records for control room activities is not sufficient to reconstruct events after the fact. The written log provides little (and sometimes no) information on actions or rationale for actions taken by the controller. On some days the control room log for a particular shift can contain as little as three or four entries. While there are database records of actions taken such as constraints applied, these are not sufficient.</p> <p>This year, we have further noted instances where the control room operator has overridden the Metrix forecast with an alternate load forecast (see Chapter 9, Table 15) without indicating the rationale for doing so (our review showed that there was no reason at the time for an override as Metrix was tracking well against SCADA actuals).</p>

9 ELECTRICITY RULES CHAPTER 7A - BALANCING MARKET

Electricity Rules Chapter 7A sets out the Balancing Market Rules.

9.1 System Management’s processes and procedures

9.1.1 Amendments to System Management obligations since last audit

There have been only transitional amendments to System Management’s obligations under Chapter 7A. Amendments relate to AEMO’s adoption of functions previously undertaken by the IMO.

9.1.2 Procedures

There have been no amendments to the Power System Operation Procedure or to System Management’s Internal Procedures relating to Chapter 7A of the Electricity Rules since last year’s market audit.

9.2 Compliance with Chapter 7A

9.2.1 Audit Activities

We have undertaken compliance testing and business process walkthroughs in the following functional areas relating to Chapter 7A of the Electricity Rules:

- We have reviewed System Management’s obligation to provide updated load forecasts to AEMO under clause 7A.3.15.

We have also reviewed self-reported and AEMO/IMO alleged instances of System Management non-compliance with Chapter 7A.

9.2.2 Audit Findings

Table 14 summarises audit findings by compliance rating and risk rating.

Table 15 provides details of audit findings that were classified as Compliance Rating 1 (i.e. incidents of non-compliance with Chapter 7A of the Electricity Rules).

Table 14: Summary of audit findings classified by compliance and risk ratings

Risk rating	Compliance rating		
	1	2	3
	0	0	0
	1	0	0

Risk rating	Compliance rating		
	1	2	3
	1	0	0

Table 15: Summary of Compliance Rating 1 Audit Findings (i.e. incidents of non-compliance with Chapter 7A of the Electricity Rules).

Electricity Rules clause	Risk Rating	Description
7A.3.7		<p>Clause 7A.3.7 requires System Management to provide AEMO (previously the IMO) within two hours of the end of the Trading Day, an estimate of the Start of Interval (SOI) Quantity and End of Interval (EOI) Quantity for each Balancing Facility and the Relevant Dispatch Quantity (RDQ), for each Trading Interval in the Trading Day. System Management has breached this clause twice during the audit period and once outside the audit period:</p> <ul style="list-style-type: none"> • On 16 October 2015, System failed to provide the IMO the EOI Quantity of Balancing Facilities and the RDQ for certain trading intervals for Trading Day 15 October 2015. The calculation of the EOI and RDQ quantities were affected by a SCADA issue. • On 15 April 2016, System Management were experiencing IT issues and provided a partial dataset for RDQ and EOI files. • On 19 July 2016 (outside audit period), System Management were experiencing IT issues and provided a partial dataset for RDQ and EOI files. <p>Breaches of this clause do not affect settlement timelines or outcomes¹⁸ as the data under Clause 7A.3.7 is used by AEMO for publishing purposes (to publish provisional and final Balancing Prices under clause 7A.3.13). In the event incomplete data is provided, AEMO can publish balancing prices using the most recent forecast Relevant Dispatch Quantity (RDQ) (from the System Management's balancing load forecasts, rather than provisional RDQ values) and applying it against the most recent Balancing Merit Order (BMO). Nevertheless, we note that this breach is related to issues with System Management's IT systems; this a recurring theme that we have noted in other breaches also.</p>
7A.3.15 (7 breaches)		<p>Clause 7A.3.15 requires System Management to provide a forecast of the Relevant Dispatch Quantity (RDQ) for each future Trading Interval. Additionally, each time it has new information on which to determine the forecast RDQ, System Management must update the forecast (but does not need to do so more than once per Trading Interval).</p> <p>System Management uses the Metrix tool to determine the forecast RDQ, which is transmitted to AEMO every half hour. However, from time to time (e.g. 2.09% of intervals during the audit period), the control room operator will over-write the Metrix forecast with an alternate forecast (if they deem the Metrix forecast to not be tracking well against the actual SCADA outputs). System Management asserts that this override is a real-time decision; the Metrix tool self-corrects within 15-20 minutes there is limited value in sending AEMO the alternate load forecast (as an update under clause 7A.3.15), as the Metrix forecast is still their best forecast for the next trading interval.</p> <p>To this end, PA reviewed System Management's use of alternate forecasts and noted seven instances in which the Metrix forecast was overridden by an alternate forecast for an extended period (the longest override was for 7.5 hours on 21 June - see Table 16). In all, but one case, System Management was unable to justify the use of these alternate forecasts as, at the time the overrides were occurring, the Metrix forecast appeared to be tracking well against actual SCADA outputs.</p> <p>We have determined these seven instances to be a breach of clause 7A.3.15 as the prolonged use of the alternate forecast is a clear indication of System Management not believing Metrix to be the best forecast of RDQ in upcoming intervals. As this is a recurring issue and System Management has no means to transmit alternate forecasts to AEMO, it is possible this breach may recur. The impact of these</p>

¹⁸ As long as corrected data is provided to AEMO before initial settlement.

Electricity Rules clause	Risk Rating	Description
		<p>particular breaches are likely to be immaterial or minor, as it is likely the alternate forecasts would have been similar to the Metrix forecasts (given how well Metrix was tracking against actuals). However, we note that this issue is a recurring and systemic issue around the provision of market data (see also Chapter 8 findings on the issuance of Dispatch Advisories). In this case, the most recent and accurate forecast should be transmitted to AEMO as this is a crucial input into the BMO. If System Management is using alternate load forecasts for multiple consecutive intervals then it is the alternate load forecast that should be transmitted to AEMO (as this is the best estimate at the time).</p> <p>We further note that there is opportunity to improve the audit trail around the use of alternate forecasts in the control room. Currently, the controller notes in the log that they have overridden Metrix but do not provide any justification for doing so. As noted above, for six of the instances reviewed, System Management was unable to provide justification for the Metrix load forecast override. We recommend instituting a more robust audit trail in this area.</p>

Table 16: Selected instances of Metrix load forecast override

Load forecast override – start time	Load forecast override – end time	Total consecutive period over which Metrix load forecast overwritten (hh:mm:ss)
16-Aug-2015 11:00:49	16-Aug-2015 14:21:18	3:20:29
23-Aug-2015 09:29:20	23-Aug-2015 12:20:58	2:51:38
24-Aug-2015 10:14:17	24-Aug-2015 12:50:19	2:36:02
26-Aug-2015 11:05:39	26-Aug-2015 14:35:20	3:29:41
28-Jan-2016 00:59:54	28-Jan-2016 03:39:13	2:39:19
30-Jan-2016 10:14:01	30-Jan-2016 12:59:25	2:45:24
21-Jun-2016 08:41:37	21-Jun-2016 16:09:59	7:28:22

10 ELECTRICITY RULES CHAPTER 7B – LFAS MARKET

Electricity Rules Chapter 7B sets out the Load Following and Ancillary Services (LFAS) Market Rules.

10.1 System Management’s processes and procedures

10.1.1 Amendments to System Management obligations since last audit

There have been only transitional amendments to System Management’s obligations under Chapter 7B. Amendments relate to AEMO’s adoption of functions previously undertaken by the IMO.

10.1.2 Procedures

There have been no amendments to the Power System Operation Procedure or to System Management’s Internal Procedures relating to Chapter 7B of the Electricity Rules since last year’s market audit.

10.2 Compliance with Chapter 7B

10.2.1 Audit Activities

We have undertaken compliance testing and business process walkthroughs in the following functional areas relating to Chapter 7B of the Electricity Rules:

- LFAS dispatch: We have reviewed System Management’s LFAS enablement for selected intervals during the audit period against system inputs (i.e. the LFAS merit order) to determine System Management has enabled LFAS in accordance with clause 7B.3.6.

We have also reviewed self-reported and AEMO/IMO alleged instances of System Management non-compliance with Chapter 7B.

10.2.2 Audit Findings

Table 17 summarises audit findings by compliance rating and risk rating.

Table 18 provides details of audit findings that were classified as Compliance Rating 1 (i.e. incidents of non-compliance with Chapter 7B of the Electricity Rules).

Table 17: Summary of audit findings classified by compliance and risk ratings

Risk rating	Compliance rating		
	1	2	3
	0	0	0
	1	0	0

Risk rating	Compliance rating		
	1	2	3
	1	0	0

Table 18: Summary of Compliance Rating 1 Audit Findings (i.e. incidents of non-compliance with Chapter 7B of the Electricity Rules).

Electricity Rules clause	Risk Rating	Description
7B.1.4 (two breaches)		<p>Clause 7B.1.4 requires System Management to provide AEMO, by 12:00pm on the Scheduling Day, System Management's forecast of the LFAS Quantity for each Trading Interval in the next Trading Day. System Management breached this clause twice during the audit period (on 17 February 2016 and 2 June 2016). On both these occasions, as a result of oversight, System Management sent the LFAS Requirements data file to AEMO approximately 40 minutes late. Note, however, that the LFAS quantities are always 72MW. This, coupled with the fact that the late transmission did not affect any market operations timelines for AEMO, means that the impact of this breach is immaterial.</p>
7B.3.6 (three breaches)		<p>Clause 7B.3.6 requires System Management to enable facilities for load following in reasonable proportion to the LFAS Merit Order determined by AEMO. PA's analysis of BMO and LFAS dispatch data has uncovered three intervals (21-2, 22-1, 22-2) on 6 January 2016, where a facility was cleared for LFAS but not enabled. System Management instead enabled a different facility. As a result, the facility (who was cleared but not enabled) would have foregone revenue.</p> <p>We note this is a recurring breach that we have noted in previous audits. We note further that System Management was unable to provide us with a reason for the breach. As such, we reiterate our finding regarding the absence of audit trail in control room operations.</p>

11 ELECTRICITY RULES CHAPTER 8 – WHOLESALE MARKET METERING

Chapter 8 of the Electricity Rules sets out obligations relating to metering, including: Metering Data Agents; Meter Registry; Meter Data Submissions; Metering Protocol Requirements; and Support of Calculations.

11.1 Compliance with Chapter 8

System Management has no obligations under Chapter 8 of the Electricity Rules.

12 ELECTRICITY RULES CHAPTER 9 – SETTLEMENT

Chapter 9 of the Electricity Rules sets out obligations relating to Settlement Data; Settlement Calculations; Settlement Statements; Invoicing and Payment; and Default and Settlement in Default Situations.

12.1 System Management’s processes and procedures

12.1.1 Rule amendments

There have been only transitional amendments to System Management’s obligations under Chapter 9. Amendments relate to AEMO’s adoption of functions previously undertaken by the IMO.

12.1.2 Procedures

There have been no amendments to the Power System Operation Procedure or to System Management’s Internal Procedures relating to Chapter 9 of the Electricity Rules since last year’s market audit.

12.2 Compliance with Chapter 9

12.2.1 Audit Activities

We have also reviewed self-reported and AEMO/IMO alleged instances of System Management non-compliance with Chapter 9.

12.2.2 Audit Findings

Table 19 summarises audit findings by compliance rating and risk rating.

Table 18 provides details of audit findings that were classified as Compliance Rating 1 (i.e. incidents of non-compliance with Chapter 9 of the Electricity Rules).

Table 19: Summary of audit findings classified by compliance and risk ratings

Risk rating	Compliance rating		
	1	2	3
	0	0	0
	1	0	0
	0	0	0

Table 20: Summary of Compliance Rating 1 Audit Findings (i.e. incidents of non-compliance with Chapter 9 of the Electricity Rules).

Electricity Rules clause	Risk Rating	Description
<p>9.20.5(c)(ii)</p> <p>See related breach of clause 3.22.3 in Chapter 4.</p>		<p>Clause 9.20.5(c)(ii) requires System Management to provide corrected information for settlement adjustment purposes. On 6 July 2015, System Management provided updated Ancillary Services contract information to AEMO (in relation to a previous breach of clause 3.22.3 on 16 May 2015). However, this updated information contained an error. The breach resulted in the market participant being paid an incorrect amount during the first adjustment (a discrepancy of \$72,365.91). AEMO subsequently rectified this error in the second adjustment.</p> <p>The manual nature of compiling the ancillary services information means that error may occur from time to time.</p>

13 ELECTRICITY RULES CHAPTER 10 – MARKET INFORMATION

Chapter 10 of the Electricity Rules sets out obligations relating to Market Information, including: confidentiality; and publication on the Market Web Site.

13.1 System Management's processes and procedures

13.1.1 Amendments to System Management obligations since last audit

System Management has limited obligations under Chapter 10. Amendments relate to AEMO's adoption of functions previously undertaken by the IMO.

13.1.2 Procedures

System Management has no procedures relating to Chapter 10 of the Electricity Rules.

13.2 Compliance with Chapter 10

We have not conducted any audit procedures to assess System Management's compliance with Chapter 10 of the Electricity Rules.

There have been no self-reported or IMO/AEMO alleged instances of System Management non-compliance with Chapter 10.



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Appendix 4 – Independent Assurance Report: AEMO’s compliance with the Gas Services Information Rules



AUSTRALIAN ENERGY MARKET OPERATOR

Independent Assurance Report: AEMO's
compliance with the Gas Services
Information Rules

FINAL REPORT

9 December 2016



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FINAL

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FOREWORD

PA Consulting Group undertakes the Western Australian (WA) operational market audits which include:

- An Electricity Compliance Audit of the market operator¹ (*Audit 1*)
- An Electricity Software Compliance Audit of the market operator (*Audit 2*)
- A Gas Compliance Audit of the market operator² (*Audit 3*)
- An Electricity Compliance Audit of the system operator³ (*Audit 4*).

This independent assurance report pertains to Audit 3 above and is part of a series of four audit reports. The reports in this series are:

- *Audit 1: Independent Assurance Report: Compliance of AEMO's internal procedures and business processes with the Wholesale Electricity Market Rules and AEMO's compliance with the Wholesale Electricity Market Rules and Market Procedures*
- *Audit 2: Independent Assurance Report: Compliance of AEMO's software systems and processes for software management*
- *Audit 3: Independent Assurance Report: AEMO's compliance with the Gas Services Information Rules*
- *Audit 4: Independent Assurance Report: System Management's compliance with the Wholesale Electricity Market Rules and Market Procedures*

¹ Australian Energy Market Operator (AEMO) from the AEMO Transition Date as defined in the Electricity Rules (8AM, November 30th 2015); Independent Market Operator (IMO) prior to the AEMO Transition Date.

² Australian Energy Market Operator (AEMO) from the AEMO Transition Date as defined in the GSI Rules (8AM, November 30th 2015); Independent Market Operator (IMO) prior to the AEMO Transition Date.

³ Australian Energy Market Operator (AEMO) from the System Management Transition Date as defined in the Electricity Rules (8AM, 1 July 2016); Western Power (System Management) (SM), prior to the System Management Transition Date.

EXECUTIVE SUMMARY

This independent assurance report sets out the results of the market audit conducted by PA Consulting Group (PA) of:

- The compliance of AEMO's internal procedures and business processes with the GSI Rules
- AEMO's compliance with the GSI Rules and GSI Procedures
- 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

Regulatory context and scope

The audit of AEMO's gas compliance (referred to as Audit 3) is conducted under GSI Rule 174(1) and 174(2), supplemented by the transitional rule in Schedule 3, Part 2, Rule 4, which requires AEMO to ensure that for the first audit following the AEMO Transition Date⁴, the auditor audits both AEMO (for activities on and from the transition date) and the IMO (in respect of its activities before the transition date).

Audit Period

The Audit Year is 1 August 2015 to 30 June 2016, both dates inclusive.

Audited Entity

For avoidance of doubt, the Audited Entity for this audit is:

- The Independent Market Operator (IMO) prior to the AEMO Transition Date
- The Australian Energy Market Operator (AEMO) on and from the AEMO Transition Date.

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 Audited Entity's internal procedures with the GSI Rules, and
- Software systems for the GBB and GSI Fees calculations

We provide limited assurance under this standard with respect to our review of:

- The Audited Entity's compliance with the GSI Rules and GSI Procedures, and
- The Audited Entity's software management processes.

⁴ 30 November 2015

Risk ratings and materiality

Risk ratings

Audit findings are categorised as follows:

Table 1: Compliance Ratings for Audit Findings

Compliance rating	Description
1	Instances of non-compliance with GSI Rules and GSI Procedures noted in audit
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).

Table 2: Risk Ratings for Audit Findings

Risk rating	Description
Critical 	Potential for catastrophic impact on dispatch, settlement or other market outcomes if not addressed immediately. Requires executive actions and monitoring at board level.
Significant 	Potential for major impact on dispatch, settlement 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 dispatch, settlement or other market outcomes if not addressed within a reasonable timeframe. Requires management attention with regular monitoring.
Low 	Potential for minor impact on dispatch, settlement or other market outcomes if not addressed in the future. Requires team level attention with regular monitoring.

Table 3: Risk rating matrix

		Consequence of risks associated with finding				
		Immaterial	Minor	Moderate	Major	Extreme
Likelihood of risk manifesting if finding not addressed	Almost Certain	Medium	Medium	Significant	Critical	Critical
	Likely	Low	Medium	Significant	Critical	Critical
	Possible	Low	Medium	Significant	Significant	Critical
	Unlikely	Low	Low	Medium	Medium	Significant
	Rare	Low	Low	Medium	Medium	Significant

Qualification of audit opinion

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

- Purpose and objectives of the audit
- AEMO’s overall objectives
- AEMO’s risk matrix definitions of impact
- Financial impacts on participants
- The number of participants or other stakeholders affected
- The impact of an issue on the GSI objectives
- Whether or not an issue is systemic
- Whether or not an issue is recurring (from previous audits).

Audit activities

Review of Audited Entity’s processes and procedures

We have undertaken a combination of reviews of self-reported incidents of non-compliance, compliance auditing and business process walkthroughs.

Our audit activities were focused on subset of functional areas based on residual compliance risk, materiality and rule changes occurring in the Audit Period. These areas include:

- Provision of information to the IMO
- Budgeting and division of fees
- Separation of procedures (removal of IMO and ERA obligations from AEMO procedures)
- EMF activation.

While the transition of functions to AEMO affected a large number of obligations, and gave the AEMO a somewhat reduced set of functions (as compared to the IMO prior to transition date), there were no substantive changes affecting the performance of GSI functions.

AEMO staff have provided all information, documentation and data required for our audit procedures.

We conducted one field-visit in September 2016 to interview AEMO staff and to conduct the business process walkthroughs.

Review of Audited Entity’s GSI software and software management processes

AEMO’s software management processes were reviewed as part of Audit 2. The results of this review can be viewed in Chapter 2 of the report entitled “*Audit 2: Compliance of AEMO’s market software systems and processes for software management*”. While the focus of that report is on AEMO’s processes in regards to management of WEM software, the same processes are used in the management of software used in GSI systems.

We approached the audit in two components, respectively examining:

1. AEMO’s software management processes and controls and
2. Changes to the software itself.

With respect to the software management processes and controls we have:

- Examined the documented processes for software management
- Compared them to actual operational practices through interviews with AEMO staff and inspections of process records
- Reviewed the compliance of operational practices with the GSI Rules and GSI Procedures.

With respect to the software changes, we have:

- Reviewed all system changes implemented since the last audit
- Reviewed whether or not those changes have been certified as required under the GSI Rules
- Reviewed all rule changes commencing since the last audit
- Assessed whether a rule change requires a change to the systems
- Identified where those changes have not been implemented.

We conducted one field-visit in September 2016 to interview AEMO staff and to walk through the software management processes.

All audit information (documentation, logs and system outputs) has been provided to us by AEMO’s Operations and IT team.

Findings and recommendations

Summary of audit findings

Table 4 summarises audit findings by compliance and risk rating.

Subsequent sections of this report provide a detailed explanation of each finding on a rule part by rule part basis.

Table 4: Summary of audit findings classified by compliance and risk ratings

Risk rating	Compliance rating		
	1	2	3
	No findings	No findings	No findings
	No findings	No findings	No findings
	No findings	1	No findings
	1	2	No findings

Table 5 breaks down the audit findings further by part of the GSI Rules. Subsequent sections of this report provide a detailed explanation of each finding on rule part by part basis.

Table 5: Summary of audit findings broken by part of GSI Rules

Part	Compliance rating		
	1	2	3
2: Registration	No findings	 1	No findings
4: Gas Bulletin Board	 1	No findings	No findings
7: Budget and Fees	No findings	 1  1	No findings

Key findings

AEMO (and the IMO before it) continues to take rule compliance seriously, and has a robust suite of controls in place to manage compliance risk. The organisation is proactive in reporting and addressing compliance issues.

We have found some issues relating to the currency of AEMO’s internal procedures, including internal procedures for market fees, AEMO budget, and GBB registration. In particular, internal procedures 5.2 *Determination of AEMO Budget*, and 5.3 *Fees*, still reflect the processes required by the rules prior to the AEMO Transition Date. The full set of new obligations has not yet been triggered, and we have not observed anything that suggests there has actually been an issue in these areas, but correct procedure documentation is an important control for compliance risk.

Opinion

Qualifications

The following qualifications apply to our opinion with respect to whether AEMO’s internal procedures and business processes comply with the GSI Rules in all material respects:

- AEMO’s internal procedures 5.2 *Determination of AEMO Budget* and 5.3 *Fees* have not been updated to reflect the 30 November transfer of IMO functions to AEMO, and if followed as written, would lead to non-compliance with part 7 of the GSI Rules.

Opinion with respect to the Audited Entity's compliance of procedures and business processes with the GSI Rules

Subject to the inherent limitations set out in Section 1.3.4 and the qualifications set out above, it is our opinion that AEMO's internal procedures and business processes comply with the GSI Rules in all material respects.

Opinion with respect to the Audited Entity's compliance with the GSI Rules and GSI Procedures

Subject to the inherent limitations set out in Section 1.3.4, 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 has not been compliant with the GSI Rules and GSI Procedures during the Audit Period, in all material respects.

Subject to the inherent limitations set out in Section 1.3.4, 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 the IMO has not been compliant with the GSI Rules and GSI Procedures during the Audit Period prior to 30 November 2015, in all material respects.

Opinion with respect to the Audited Entity's processes for software management

Subject to the inherent limitations set out in Section 1.3.4, 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 were not compliant with the GSI Rules and GSI Procedures during the Audit Period, in all material respects.

Subject to the inherent limitations set out in Section 1.3.4, 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 the IMO's processes for software management were not compliant with the GSI Rules and GSI Procedures during the Audit Period prior to 30 November 2015, in all material respects.

Opinion with respect to the compliance of software systems for the GBB and GSI Fees calculations with the GSI Rules and GSI Procedures

Subject to the inherent limitations set out in Section 1.3.4, it is our opinion that the software used by AEMO in the operation of the GBB, and in the calculation of GSI Fees, has been compliant with the GSI Rules and GSI Procedures, in all material respects.

PA Consulting Group



A handwritten signature in black ink, appearing to read 'SJT', written over a light grey rectangular background.

Stephen James Thornton

Member of PA's Management Group

9 December 2016

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1 INTRODUCTION

This chapter sets out the regulatory context for Audit 3 and our approach to performing the audit.

1.1 Regulatory context and scope

The requirement for the audit of the AEMO is set out in the Gas Services Information Rules (the GSI Rules).

Table 6 provides further detail on the heads of power that mandate this audit.

Table 6: GSI Rules references pertaining to audits

Clause reference	Comment
174 (1)	Requirement for AEMO to appoint auditor at least annually
174 (2)	Defines the scope for Audit 3 to include: <ul style="list-style-type: none">• the compliance of AEMO's internal procedures and business processes with the GSI Rules• AEMO's compliance with the GSI Rules and Procedures⁵• AEMO's software systems for the Gas Bulletin Board (GGB) and the calculation of GSI Fees and processes for software management
Schedule 3, Part 2, Rule 4 (Transitional)	Requires the audited entity to be IMO prior to the AEMO Transition Date and AEMO thereafter

This report covers our audit of AEMO and the IMO under 174 (1) and (2).

At the time of the previous audit there were no obligations on AEMO, nor did AEMO have any documented procedures relating to the GSI Rules. On 30 November 2015, most IMO functions and rule obligations were transferred to AEMO. The personnel implementing the obligations largely remained the same, as did the IT systems, operational processes, procedure documentation, and other controls. This means that from an operational perspective, there is continuity between the two organisations, and for this reason, where we refer to amendments or changes to AEMO obligations or AEMO procedures, we mean the differences between AEMO obligations or procedures and the equivalent IMO obligations or procedures as at the time of the previous audit.

1.2 Audited Entity

For avoidance of doubt, the Audited Entity for this audit is:

- The Independent Market Operator (IMO) prior to the AEMO Transition Date
- AEMO following the AEMO Transition Date.

⁵ Procedures defined in the GSI Rules will be referred to from here-on as GSI Procedures to clearly distinguish them from Market Procedures as defined under the Electricity Rules.

1.3 Approach

1.3.1 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 Audited Entity's internal procedures with the GSI Rules, and
- Software systems for the GBB and GSI Fees calculations

We provide limited assurance under this standard with respect to our review of:

- The Audited Entity's compliance with the GSI Rules and GSI Procedures, and
- The Audited Entity's software management processes

1.3.2 Risk ratings and materiality

Compliance and risk ratings

Audit findings are categorised as shown in Table 7:

Table 7: Compliance Ratings for Audit Findings

Compliance rating	Description
1	Instances of non-compliance with GSI Rules and GSI Procedures noted in audit.
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 ratings for audit findings were set in consultation with AEMO and are set out in Table 8.

Table 8: Risk Ratings for Audit Findings

Risk rating	Description
Critical 	Potential for catastrophic impact on dispatch, settlement or other market outcomes if not addressed immediately. Requires executive actions and monitoring at board level.
Significant 	Potential for major impact on dispatch, settlement 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 dispatch, settlement or other market outcomes if not addressed within a reasonable timeframe. Requires management attention with regular monitoring.

Risk rating	Description
Low 	Potential for minor impact on dispatch, settlement or other market outcomes if not addressed in the future. Requires team level attention with regular monitoring.

Each finding has been categorised according to its impact and likelihood, using the matrix in Table 9, and AEMO's standard impact definitions shown in Table 10.

Table 9: Classification of Audit Findings

		Consequence of risks associated with finding				
		Immaterial	Minor	Moderate	Major	Extreme
Likelihood of risk manifesting if finding not addressed	Almost Certain	Medium	Medium	Significant	Critical	Critical
	Likely	Low	Medium	Significant	Critical	Critical
	Possible	Low	Medium	Significant	Significant	Critical
	Unlikely	Low	Low	Medium	Medium	Significant
	Rare	Low	Low	Medium	Medium	Significant

Table 10: 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 or <1 day for electricity market	No restriction of supply No disruption to markets
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

Qualification of audit opinion

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

- Purpose and objectives of the audit
- AEMO’s overall objectives
- AEMO’s risk matrix definitions of impact
- Financial impacts on participants
- The number of participants or other stakeholders affected
- The impact of an issue on the GSI objectives
- Whether or not an issue is systemic
- Whether or not an issue is recurring (from previous audits).

1.3.3 Audit activities

Review of Audited Entity’s processes and procedures

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.
- 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 the AEMO (WA) teams, with a particular emphasis on the market operations team.

The first two activities were conducted as part of a field-visit in September 2016. 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:

- Provision of information to the IMO
- Budgeting and division of fees
- Separation of procedures
- EMF activation.

AEMO staff have provided all information, documentation and data required for our audit procedures.

While the transition of functions to AEMO affected a large number of obligations, and gave the AEMO a slightly reduced set of functions (as compared to the IMO prior to transition date), there were no substantive changes affecting the performance of market functions.

Review of Audited Entity’s GSI software and software management processes

We have approached the audit in two components⁶, respectively examining:

⁶ AEMO’s software management processes were reviewed in a separate audit conducted by PA concurrently with this audit. The results of this review can be viewed in Chapter 2 of the report entitled “*Audit 2: Compliance of AEMO’s market software systems and processes for software management*”. While the focus of that report is on AEMO’s processes in regards to management of WEM software, the same processes are used in the management of software used in GSI systems.

1. AEMO's software management processes and controls and
2. Changes to the software itself.

With respect to the software management processes and controls we have:

- Examined the documented processes for software management
- Compared them to actual operational practices through interviews with AEMO staff and inspections of process records
- Reviewed the compliance of operational practices with the GSI Rules.

With respect to the software changes, we have:

- Reviewed all system changes implemented since the last audit
- Reviewed whether or not those changes have been certified as required under the GSI Rules
- Reviewed all rule changes commencing since the last audit
- Assessed whether a rule change requires a change to the systems
- Identified where those changes have not been implemented.

We conducted one field-visit in September 2016 to interview AEMO staff and to walk through the software management processes.

All audit information (documentation, logs and system outputs) has been provided to us by AEMO's Operations and IT team.

1.3.4 Inherent limitations and qualifications

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.

An audit does not guarantee every procedure and action carried out in the operation of the GSI functions 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 are therefore subject to the following caveats:

1. 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, in the event that we were to detect any fraudulent or illegal activity, we would report this to AEMO. No such findings have been made during this audit.
2. 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. Specifically, our business process reviews assessing the use of controls were undertaken after the end of the Audit Period. As such:
 - a. Although our findings are indicative of AEMO's practices during the Audit Period, they do not constitute definitive evidence that AEMO applied those controls during the Audit Period.
 - b. Projections of our findings to future periods carry the risk that:

- i. Controls may become inadequate over time due to changes in the GSI Rules or AEMO's business processes, procedures and systems
 - ii. The degree of compliance with the control procedures we have reviewed deteriorates over time.
3. We have reviewed the governance of AEMO's internal procedures, and are satisfied that the change management process described is robust. However, we have not tested the AEMO's operational compliance against its procedure change management policies and have relied on the AEMO's list of documented changes to internal procedures, including some which are still in draft status. Further, we have focused on changes relating to rule changes in the Audit Period, and sample checks of obligations that have not changed, and have not exhaustively reviewed all procedures against all rule obligations. Therefore, there is a minor risk that unauthorised changes may have been made to internal procedures that we have not reviewed.

1.4 Structure of this report

The remainder of this report is structured based on the parts of the GSI Rules and includes:

- A brief summary of rule part contents.
- Commentary on whether AEMO's procedures (GSI Procedures and Internal Procedures) have been updated during the Audit Year, and whether they comply with the Rules. Our internal procedure review included consideration of the 1 July 2016 rule changes.
- Commentary on AEMO's operational compliance and areas of compliance risk (where relevant).

Unless otherwise specified, all references to the GSI Rules refer to the most recently applicable rules as at the end of the Audit Year (i.e. the GSI Rules as at 30 November 2015).

2 PART 1: INTRODUCTORY AND 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 AEMO processes and procedures

2.1.1 Rule amendments

Rule changes relate to the transfer of functions from the IMO to AEMO. Most (but not all) of the obligations previously placed on the IMO under Part 1 have been transferred to AEMO. Obligations not transferred to AEMO include oversight and secretariat functions for the Gas Advisory Board.

2.1.2 Procedures

The following GSI Procedures relating to Part 1 of the GSI Rules were updated in the Audit Period.

ID	Title	Updated
GSI2	Operation of the Gas Bulletin Board (WA) and the Emergency Management Facility	November 2015

The following Internal Procedures relating to Part 1 have been updated since the last audit:

ID	Title	Updated
1.2	Compliance Monitoring and Enforcement	July 2016
1.4	Market Audits	June 2016

2.1.3 Compliance of AEMO's Procedures with Part 1 of the GSI Rules

We have not noted any instances in which AEMO's Internal Procedures, if followed, would result in non-compliance with Part 1.

2.2 Compliance with Part 1

2.2.1 Audit Activities

We have undertaken compliance testing and business process walkthroughs in the following functional areas relating to Part 1 of the GSI Rules:

- Provision of information to the IMO
- Separation of procedures (removal of IMO and ERA obligations from AEMO procedures)

2.2.2 Audit Findings

There are no findings relating to Part 1.

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 participants and facilities, including registration, deregistration, transfers, and exemptions.

3.1 AEMO processes and procedures

3.1.1 Rule amendments

All obligations previously placed on the IMO under Part 2 have been transferred to AEMO. A handful of new obligations to notify the IMO in certain situations have been added.

3.1.2 Procedures

The following GSI Procedures relating to Part 2 of the GSI Rules were updated in the Audit Period.

ID	Title	Updated
GSI1	GBB Registration	November 2015

The following Internal Procedures relating to Part 2 have been updated since the last audit:

ID	Title	Updated
CF1	GBB Work Instructions (confluence)	August 2015

3.1.3 Compliance of AEMO's Procedures with Part 2 of the GSI Rules

We have noted the following instances in which AEMO's internal procedures, if followed, would result in non-compliance with Part 2:

- AEMO's confluence wiki functions as the internal procedures for GSI functions. They have not been updated to include new obligations arising from the 30 November 2015 transfer of IMO functions to AEMO.

3.2 Compliance with Part 2

3.2.1 Audit Activities

We have undertaken compliance testing and business process walkthroughs in the following functional areas relating to Part 2 of the GSI Rules:

- Provision of information to the IMO.

3.2.2 Audit Findings

Table 11 summarises audit findings by compliance rating and risk rating.

Table 12 provides details of audit findings that were classified as Compliance Rating 2 and 3.

Table 11: Summary of audit findings classified by compliance and risk ratings

Risk rating	Compliance rating		
	1	2	3
		1	

Table 12: Summary of Compliance Rating 2 & 3 Audit Findings

Finding	Compliance & Risk Rating	Description
<p>Confluence work instructions for GBB registration have not been updated for IMO->AEMO transition</p>	<p>2 L</p>	<p>AEMO's confluence wiki functions as the internal procedures for GSI functions. They have not been updated to reflect the 30 November 2015 transfer of IMO functions to AEMO. In particular, they are missing rules 34(4), 36(5) and 39(5) which relate to advising the IMO of any conditions AEMO impose on a registered, deregistered or transferred facility.</p> <p>The changes are relatively minor, and are only triggered with new registrations, deregistrations, or transfers, so we have not observed anything that suggests there has actually been an issue in this area. Nevertheless, correct procedure documentation is an important control for compliance risk. If the instructions were followed as written, AEMO would not comply with the rules.</p>

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 AEMO processes and procedures

4.1.1 Rule amendments

All obligations previously placed on the IMO under Part 3 have been transferred to AEMO.

4.1.2 Procedures

The following GSI Procedures relating to Part 3 of the GSI Rules have been updated since the last audit.

ID	Title	Updated
GS11	GBB Registration	November 2015

There are no internal procedures relating to Part 3.

4.1.3 Compliance of AEMO’s Procedures with Part 3 of the GSI Rules

We have not noted any instances in which AEMO’s Internal Procedures, if followed, would result in non-compliance with Part 3.

4.2 Compliance with Part 3

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 AEMO processes and procedures

5.1.1 Rule amendments

All obligations previously placed on the IMO under Part 4 have been transferred to AEMO.

5.1.2 Procedures

There are no GSI Procedures or internal procedures relating to Part 4 of the GSI Rules.

5.2 Compliance with Part 4

5.2.1 Audit Activities

We have undertaken compliance testing and business process walkthroughs in the following functional areas relating to Part 4 of the GSI Rules:

- EMF activation.

5.2.2 Audit Findings

Table 13 summarises audit findings by compliance rating and risk rating.

Table 14 provides details of audit findings that were classified as Compliance Rating 1 (i.e. incidents of non-compliance with Part 4 of the GSI Rules).

Table 13: Summary of audit findings classified by compliance and risk ratings

Risk rating	Compliance rating		
	1	2	3
	1		

Table 14: Summary of Compliance Rating 1 Audit Findings (i.e. incidents of non-compliance with Part 4 of the GSI Rules).

GSI Rule	Risk Rating	Description
86		<p>Rule 86 (1) requires AEMO (and previously the IMO) to publish Nominated and Forecast flow information on the GBB for each Gas Day. This information is submitted by Pipeline Operators under Rule 59 (1) and (2) by 6pm the day before, and updated under Rule 59 (3) on the day.</p> <p>From GSI commencement until August 2016, the IMO and AEMO published the first 86(1) data at 6am. However, this initial publication was based on the latest submitted data (the 59(3) data) which related to the previous day, rather than the latest submitted data for the current day (the 59(1) and (2) data). The reports were recalculated correctly on the receipt of the first 59(3) submission for the current day.</p> <p>The IMO and AEMO did publish the correct data every day, but for between 2 and 5 ½ hours at the beginning of each day, incorrect data was displayed. This issue was caused by a software bug in the GBB, which was corrected in August 2016.</p> <p>We have deemed these incidents to be non-material incidents as it is unlikely that participant decisions would have been affected by the incorrect information in that timeframe.</p>

6 PART 5: THE 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 AEMO processes and procedures

6.1.1 Rule amendments

All obligations previously placed on the IMO under Part 5 have been transferred to AEMO.

6.1.2 Procedures

The following GSI Procedures relating to Part 5 of the GSI Rules were updated in the Audit Period.

ID	Title	Updated
GSI2	Operation of the Gas Bulletin Board (WA) and the Emergency Management Facility	November 2015

The following Internal Procedures relating to Part 5 have been updated since the last audit:

ID	Title	Updated
CF1	GBB Work Instructions (confluence)	August 2015

6.1.3 Compliance of AEMO's Procedures with Part 5 of the GSI Rules

We have not noted any instances in which AEMO's Internal Procedures, if followed, would result in non-compliance with Part 5.

6.2 Compliance with Part 5

6.2.1 Audit Activities

We have undertaken compliance testing and business process walkthroughs in the following functional areas relating to Part 5 of the GSI Rules:

- EMF activation.

6.2.2 Audit Findings

There are no findings relating to Part 5.

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 AEMO processes and procedures

7.1.1 Rule amendments

All obligations previously placed on the IMO under Part 6 have been transferred to AEMO.

7.1.2 Procedures

There are no GSI Procedures relating to Part 6 of the GSI Rules.

The following Internal Procedures relating to Part 6 have been updated since the last audit:

ID	Title	Updated
3.7.1	Preparation of the GSOO	August 2016

7.1.3 Compliance of AEMO’s Procedures with Part 6 of the GSI Rules

We have not noted any instances in which AEMO’s Internal Procedures, if followed, would result in non-compliance with Part 6.

7.2 Compliance with Part 6

We have not conducted any audit procedures to assess AEMO’s compliance with Part 6 of the GSI Rules.

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

8 PART 7: BUDGET AND FEES

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

8.1 AEMO processes and procedures

8.1.1 Rule amendments

Many (but not all) of the obligations previously placed on the IMO under Part 7 have been transferred to AEMO. Provisions relating to the determination of the IMO budget have remained with the IMO, and new provisions introduced relating to the determination of the AEMO budget. There are also changes to fee calculations and invoicing to incorporate the multiple entities (AEMO, ERA and IMO) who recover costs through market fees, though these are amended by the transitional rules in Schedule 3.

8.1.2 Procedures

There are no GSI Procedures relating to Part 7 of the GSI Rules.

The following Internal Procedures relating to Part 7 have been updated since the last audit:

ID	Title	Updated
5.2	Determination of AEMO Budget	August 2016
5.3	Fees	August 2016

8.1.3 Compliance of AEMO's Procedures with Part 7 of the GSI Rules

We have noted the following instances in which AEMO's internal procedures, if followed, would result in non-compliance with Part 7:

- AEMO's internal procedure 5.2 *Determination of AEMO Budget* has not been updated to reflect the new (30 November 2015) provisions for AEMO budgeting
- AEMO's internal procedure 5.3 *Fees* has not been updated to reflect the 30 November transfer of IMO functions to AEMO.

8.2 Compliance with Part 7

8.2.1 Audit Activities

We have undertaken compliance testing and business process walkthroughs in the following functional areas relating to Part 7 of the GSI Rules:

- Budgeting and division of fees.

8.2.2 Audit Findings

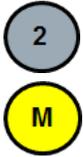
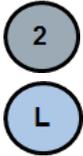
Table 15 summarises audit findings by compliance rating and risk rating.

Table 16 provides details of audit findings that were classified as Compliance Rating 2 and 3.

Table 15: Summary of audit findings classified by compliance and risk ratings

Risk rating	Compliance rating		
	1	2	3
		1	
		1	

Table 16: Summary of Compliance Rating 2 & 3 Audit Findings

Finding	Compliance & Risk Rating	Description
<p>Internal procedure 5.2 Determination of AEMO Budget has not been updated to reflect rule changes in the period</p>		<p>This internal procedure has not been updated to reflect the new (30 November 2015) rules around AEMO budgeting, in particular there is no implementation of the new Rules 111A(1)-(6) "Determination of AEMO Budget".</p> <p>The full set of new obligations has not yet been triggered, and we have not observed anything that suggests there has actually been an issue in this area, but correct procedure documentation is an important control for compliance risk. If the procedure were followed as written, AEMO would not comply with the rules.</p>
<p>Internal procedure 5.3 Fees has not been updated to reflect rule changes in the period</p>		<p>This internal procedure has not been updated to reflect the new rules around setting and paying GSI fees, and in particular, makes no mention of payments to the IMO and ERA.</p> <p>The full set of new obligations has not yet been triggered, and we have not observed anything that suggests there has actually been an issue in this area. Payments have been made to the IMO and ERA on a reasonable basis, as per transitional provisions, and were not required to be itemized on GSI invoices during the audit year. Nevertheless, correct procedure documentation is an important control for compliance risk. If the procedure were followed as written, AEMO would not comply with the rules.</p> <p>We understand that AEMO has drafted, but not yet approved, updates to this procedure.</p>

9 PART 8: RULE CHANGES

Part 8 of the GSI Rules details the process for making changes to the GSI Rules, including rule change proposals, consultations, approvals and timelines.

9.1 AEMO processes and procedures

9.1.1 Rule amendments

None of the obligations previously placed on the IMO under Part 8 have been transferred to AEMO.

9.1.2 Procedures

There are no GSI Procedures or Internal Procedures relating to Part 8 of the GSI Rules, as the IMO's 'Rule Change' internal procedure was not retained by AEMO after 30 November 2015.

9.2 Compliance with Part 8

9.2.1 Audit Activities

We have undertaken compliance testing and business process walkthroughs in the following functional areas relating to Part 8 of the GSI Rules:

- Separation of procedures (removal of IMO and ERA obligations from AEMO procedures).

9.2.2 Audit Findings

There are no findings relating to Part 8.

There have been no self-reported instances of non-compliance with Part 8.

10 PART 9: GSI PROCEDURES

Part 9 of the GSI Rules details the process for developing and changing GSI Procedures, including subject matter, procedure change proposals, consultations, approvals, publication, and timelines.

10.1 AEMO processes and procedures

10.1.1 Rule amendments

Procedure making obligations previously placed solely on the IMO under Part 9 are now placed on both IMO and AEMO, but only in relation to their respective functions.

10.1.2 Procedures

There are no GSI Procedures relating to Part 9 of the GSI Rules.

The following Internal Procedures relating to Part 9 have been updated since the last audit:

ID	Title	Updated
4.2.2	Market Procedure Change	July 2016

10.1.3 Compliance of AEMO's Procedures with Part 9 of the GSI Rules

We have not noted any instances in which AEMO's Internal Procedures, if followed, would result in non-compliance with Part 9.

10.2 Compliance with Part 9

10.2.1 Audit Activities

We have undertaken compliance testing and business process walkthroughs in the following functional areas relating to Part 9 of the GSI Rules:

- Separation of procedures (removal of IMO and ERA obligations from AEMO procedures).

10.2.2 Audit Findings

There are no findings 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 AEMO processes and procedures

11.1.1 Rule amendments

Annual compliance audit obligations previously placed on the IMO under Part 10 have been transferred to AEMO. All other IMO obligations under Chapter 10 were retained by the IMO, and transferred to the ERA on 1 July 2016. New obligations were added requiring AEMO to support the IMO's (and subsequently the ERA's) monitoring functions.

11.1.2 Procedures

There are no GSI Procedures relating to Part 10 of the GSI Rules.

The following Internal Procedures relating to Part 10 have been updated since the last audit:

ID	Title	Updated
1.2	Compliance Monitoring and Enforcement	July 2016
1.4	Market Audits	June 2016
1.14	GBB CAST	February 2016

11.1.3 Compliance of AEMO's Procedures with Part 10 of the GSI Rules

We have not noted any instances in which AEMO's Internal Procedures, if followed, would result in non-compliance with Part 10.

11.2 Compliance with Part 10

11.2.1 Audit Activities

We have undertaken compliance testing and business process walkthroughs in the following functional areas relating to Part 10 of the GSI Rules:

- Separation of procedures (removal of IMO and ERA obligations from AEMO procedures).

11.2.2 Audit Findings

There are no findings relating to Part 10.

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

12 SCHEDULE 3: TRANSITIONAL RULES

Schedule 3 of the GSI Rules covers the transitional arrangements leading up to, and for a period after:

- the date when the GSI Rules took effect (GSI Commencement Date)
- the date when GSI functions were transferred from the IMO to AEMO (AEMO Transition Date)
- the date when GSI functions were transferred from the IMO to the ERA (ERA Transfer Date).

12.1 AEMO processes and procedures

12.1.1 Rule amendments

Transitional obligations relating to GSI Commencement were not amended, and remained with the IMO. New transitional obligations were introduced relating to AEMO Transition Date and ERA Transfer Date, including relaxation of some of AEMO's budgeting and fee setting obligations.

12.1.2 Procedures

There are no GSI Procedures relating to Schedule 3 of the GSI Rules.

The following Internal Procedures relating to Schedule 3 have been updated since the last audit:

ID	Title	Updated
5.2	Determination of AEMO Budget	August 2016
5.3	Fees	August 2016

12.1.3 Compliance of AEMO's Procedures with Schedule 3 of the GSI Rules

We have not noted any instances in which AEMO's Internal Procedures, if followed, would result in non-compliance with Schedule 3.

12.2 Compliance with Schedule 3

12.2.1 Audit Activities

We have undertaken compliance testing and business process walkthroughs in the following functional areas relating to Schedule 3 of the GSI Rules:

- Budgeting and division of fees.

12.2.2 Audit Findings

There are no findings relating to Schedule 3.

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

13 GSI SYSTEMS AND SOFTWARE

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 subrule 174(2)(c) of the GSI Rules.

- Section 13.1 sets out our review of AEMO's software systems for the GBB and the calculation of GSI Fees
- Section 13.2 sets out our review of AEMO's processes for software management.

13.1 Software certification

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.

13.1.1 Certification of the GBB

The initial version of the GBB was certified by PA 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 17. 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 17: Previous production software changes

System	Version number	Release date	Material impact under 19(2)?	Certification status
GBB	1.0 (“Initial version”)	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

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 subrule 19(2). In each case, we agreed with the IMO and AEMO that certification was not required. The details of these changes are shown in Table 18.

Table 18: Changes to GBB systems in the Audit Period

System	Version number	Release date	Material impact under 19(2)?	Certification status	Comment
GBB	1.4-209-7	9/09/2015	No	Maintained	Support for yearly data extracts
GBB	1.5-255-3	3/11/2015	No	Maintained	Browser compatibility fix
GBB	1.6-289-4	29/11/2015	No	Maintained	Rebranding to AEMO
GBB	1.6-289-7	30/03/2016	No	Maintained	Fixes, new pipeline
GBB	1.7-303-6	21/06/2016	No	Maintained	Report fix, new connection point

13.1.2 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.

13.1.3 The GSI Fee Calculation Tool was updated in the Audit Period to incorporate changes to invoice presentation. The updated tool was independently certified on 24 June 2016. 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.

13.2 Software management

AEMO's software management processes were reviewed in a separate audit conducted by PA concurrently with this audit. The results of this review can be viewed in Chapter 2 of the report entitled "Audit 2: Compliance of AEMO's market software systems and processes for software management". While the focus of that report is on AEMO's processes in regards to management of WEM software, the same processes are used in the management of software used in GSI systems.

13.2.1 Management of the GBB software

In addition to the Audit 2 report, here we comment specifically on AEMO's software change management performance in relation to the GBB systems. The AEMO's obligations in this regard are specified in subrule 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 18 in the previous section.

13.2.2 Compliance of software management processes with the GSI Rules

General comment on the Audited Entity's compliance with subrule 18(1)

The AEMO's software management processes for the GBB remain sufficient to comply with the market rules.

Table 19: Comment on Audited Entity's compliance with subrule 18(1) of the GSI Rules during the Audit Year

Clause	Comment on compliance
18(1)(a)	The Audited Entity has maintained a record of all versions of market software used together with their dates in service, in the form of JIRA records.
18(1) (b)	The Audited Entity 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)	The Audited Entity has conducted appropriate testing of all new releases of the market software prior to their being placed in service.
18(1) (d)	The Audited Entity has ensured that all software versions are covered by an independent certification prior to implementation where required.

Audit Findings

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

We have no audit findings to report with respect to the compliance of the Audited Entity's processes for software management with the GSI Rules.



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Appendix 5 – AEMO’s Response to Market Auditor’s Reports

AEMO'S RESPONSE TO MARKET AUDITOR'S REPORTS

FOR AUDIT PERIOD 1 AUGUST 2015 TO 30 JUNE 2016

Published: **January 2017**





IMPORTANT NOTICE

Purpose

AEMO has prepared this document in response to the Market Auditor's reports for the annual Wholesale Electricity Market and Gas Services Information audits conducted for the period 1 August 2015 to 30 June 2016, as at the date of publication.

Disclaimer

This document or the information in it may be subsequently updated or amended. This document does not constitute legal or business advice, and should not be relied on as a substitute for obtaining detailed advice about the Wholesale Electricity Market, the Wholesale Electricity Market Rules, the Gas Services Information Rules, or any other applicable laws, procedures or policies. AEMO has made every effort to ensure the quality of the information in this document but cannot guarantee its accuracy or completeness.

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1. BACKGROUND

The Wholesale Electricity Market (WEM) Rules and the Gas Services Information (GSI) Rules require AEMO to appoint a market auditor to conduct the WA electricity and gas market audits. The audits are compliance-based reviews of AEMO's obligations under the WEM Rules, the GSI Rules and associated procedures.¹

The WEM Rules and the GSI Rules require four annual audits to be undertaken:

1. Audit 1 – WEM Market Operator – Electricity Compliance Audit;
2. Audit 2 – WEM Market Operator – Electricity Software Compliance Audit;
3. Audit 3 – GSI – Gas Compliance Audit; and
4. Audit 4 – WEM System Management – Electricity Compliance Audit.

AEMO appointed PA Consulting Group Limited to conduct the market audits for the period 1 August 2015 to 30 June 2016.

The final audit reports prepared by PA Consulting can be found on AEMO's website at <http://aemo.com.au/Electricity/Wholesale-Electricity-Market-WEM/Compliance-and-audit> and should be read in conjunction with this report.

This report sets out the matters that AEMO accepts and does not accept (and reasons for those views) with respect to the final audit reports as required under clause 2.14.4(b) of the WEM Rules and rule 174(3) of the GSI Rules.

¹ As most IMO functions were transferred to AEMO on 30 November 2015, and System Management functions were transferred from Western Power to AEMO on 1 July 2016, the market audits also took into account activities carried out during the audit period by the IMO and Western Power (in its previous System Management capacity).



2. AEMO'S RESPONSE

2.1 Overview

AEMO accepts all of PA Consulting's findings and recommendations with respect to final audit reports 1, 2 and 3.

During the audit period Western Power was responsible for System Management functions. However, those System Management functions were transferred to AEMO on 1 July 2016, so AEMO must respond to PA Consulting's findings and recommendations for final audit report 4.

On this basis, AEMO accepts all PA Consulting's findings and recommendations detailed in final audit report 4, with the exception of the following finding and recommendation:

System Management has no process to determine whether a participant has lodged an outage request to avoid exposure to paying reserve capacity refunds (as required under clause 3.19.3A(c)).

Under clause 3.19.3A(c) of the Electricity Rules, System Management must not approve an outage request made principally to avoid exposure to reserve capacity refunds. Since market start, System Management has had no process to make this determination. With AEMO adopting the system operator role, and in light of AEMO staff's greater knowledge and understanding of the Reserve Capacity Mechanism, we recommend AEMO establish a process to meet its obligations under this clause.²

2.2 Reasons

AEMO does not accept the above finding and recommendation on the basis that:

- a) Clause 3.19.3A(c) of the WEM Rules states:

In assessing whether to grant a request for Opportunistic Maintenance, System Management:

...

- (c) may decline to approve Opportunistic Maintenance for a Facility or item of equipment where it considers that the request has been made principally to avoid exposure to Reserve Capacity refunds as described in clause 4.26 rather than to perform maintenance ...*

This clause states that AEMO *may* (rather than *must*) decline to approve of Opportunistic Maintenance made principally to avoid exposure to Reserve Capacity refunds.

- b) AEMO considers that under section 10.1 of the Facility Outage Power System Operating Procedure,³ there is a documented procedure permitting System Management to query requests for Opportunistic Maintenance by requiring the relevant Market Participant or Network Operator to make a written declaration that the capacity for which Opportunistic Maintenance is being sought is available prior to the outage commencing. If a Market Participant or Network Operator fails to comply with this request, then the PSOP requires System Management to reject the Opportunistic Maintenance request. In this context, the PSOP specifically refers to System Management's discretion under clause 3.19.3A(c) of the WEM Rules, where it considers an outage request for Opportunistic Maintenance is made principally to avoid exposure to Reserve Capacity refunds.
- c) The WEM Rules do not confer any policing powers upon System Management to verify declared availability of Market Participants.

² Final audit report 4; page 22.

³ https://www.aemo.com.au/-/media/Files/Electricity/WEM/Security_and_Reliability/facility-outages-psop528697C8E166.pdf



For completeness, AEMO notes that it intends to review all System Management procedures generally, now that it has responsibility for the System Management functions.