



ROBINSON BOWMAKER PAUL



AUSTRALIAN ENERGY MARKET OPERATOR

INDEPENDENT ASSURANCE REPORT ON AEMO'S COMPLIANCE WITH
THE WEM RULES AND MARKET PROCEDURES

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EXECUTIVE SUMMARY

This independent assurance report sets out the results of the market audit by Robinson Bowmaker Paul (RBP) assessing AEMO’s compliance with the Wholesale Electricity Market Rules (WEM Rules) and Market Procedures.

AUDITED ENTITY

The audited entity for this report is AEMO.

AUDIT PERIOD

The Audit Period is 1 July 2017 to 30 June 2018, both dates inclusive.

REGULATORY CONTEXT AND SCOPE

Regulatory context

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

Table 1: Regulatory context for the Electricity Compliance 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, at minimum: <ul style="list-style-type: none">• The compliance of AEMO’s Internal Procedures and business processes with the WEM Rules• AEMO’s compliance with the WEM Rules and Market Procedures• The compliance of AEMO’s market software systems and processes for software management with clause 2.36.1 of the WEM Rules.
2.36.1	Defines obligations with respect to AEMO’s software management systems and controls; this provides the compliance criteria for the review of processes for software management

Scope

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

- How AEMO implements its obligations under the WEM Rules
- How AEMO manages non-compliance risk with respect to the obligations above
- Instances of non-compliance by AEMO during the Audit Period
- AEMO's market software systems and its processes for software management, and specifically, AEMO's compliance with clause 2.36.1 of the WEM Rules. It includes an assessment of whether:
 - AEMO maintains appropriate records
 - The software used by AEMO to implement its obligations under WEM Rules is compliant with the underlying mathematical formulations and the rules themselves.
 - AEMO has been compliant with its market systems certification obligations
 - AEMO can reproduce past results.

The Electricity Compliance Audit includes AEMO's role as both market and system operator and includes the following work streams within scope:

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

AUDIT CRITERIA

Criteria for determining operational and procedural compliance

The criterion we have used for determining the compliance of AEMO's Market Procedures is the WEM Rules dated 27 March 2018.

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

Criteria for determining control application

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

Table 2: Procedures reviewed to assess control application

AEMO functional area	Procedures against which control application has been assessed
Market Operations	Daily Operations Procedure, Prudential Requirements Procedure, Settlements Procedure and Confluence work instructions relating to Annual Loss Factor Review and NSTEM and STEM verification, billing and invoicing procedures
Reserve Capacity	Certification Procedure and Preparation of ESOO Procedure
Finance	Determination of AEMO Budget Procedures and Fees Procedure
System Management Operations Governance and Integration	Daily System Management Operations Procedure, Daily System Management Operations Contingency and Backup Procedure, Weekly Ad-hoc Market Operations Procedure, Dispatch Advisory Guidelines, Dispatch Advisory Software User Guide, Internal Procedure - Internal WEM Rule Compliance, Internal Procedure - Monitor Rule Participant Compliance,
System Management - System Operations	SOCC_UI Operation Manual, SWIS Technical Envelope, AEMO Perth Central Park Control Centre Business Continuity Plan, AEMO WA RTO Controller Roles and Tasks Guideline, AEMO WA RTO Reclassifying Contingency Events Guideline, Electronic Logbook - Assumptions Process, Electronic Logbook - Dispatch Controller, Electronic Logbook - Security Controller, Internal Guideline - Additional Ancillary Services During Commissioning Tests, Internal Procedure - Manage Real-Time Dispatch, Internal Procedure - Manage Real-Time System Security, Power System Security Processes Guideline,
System Management - Planning	MetrixIDR Technical Guide, Generator Planned Outages, Internal Guideline - definition of Significant maintenance, Internal Guideline - interpretation of outage and commissioning questions, Internal Guideline - Preferred Times for Commissioning Testing, Internal Guideline - Timeframes for Participant approval, Internal Guideline information requests for Planned Outages, Internal Procedure - Black Start Testing, Internal Procedure - Operational Forecasting, Internal Procedure - Plan and Procure Ancillary Service Quantities, Synergy Dispatch Planning, Transmission Outage Assessment Criteria, Transmission Outage Process
IT	Access Control and Authentication Standard, AEMO AD Domain Administrator Access Procedure, Application Security Standard, Backup Standard, Cyber Security Policy, Encryption Standard, Information Handling Guidelines, IT Security Incident Response Procedure, Logging and Log Management Standard, Malware Protection Standard, Mobile Computing and Remote Access Security Standard, Network Security Standard, Patch Management Standard, Secure Deletion and Disposal Standard, Workstation Security Standard, IT Change Management Policy, Incident Management Policy, Problem Management Policy, Software Configuration Management Plan, Western Power IT Branch Change Management Policy and

AEMO functional area	Procedures against which control application has been assessed
	Process, Western Power IT Problem Management Process, Western Power Release Management Guidelines, Western Power Incident Management Process

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

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

APPROACH

Assurance

This 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 AEMO’s market software with the WEM Rules and Market Procedures
- We provide limited assurance under this standard with respect to our review of:
 - AEMO’s compliance with the WEM Rules and Market Procedures
 - AEMO’s software management processes and controls

Compliance and risk ratings

Table 3: Compliance and risk rating definitions

Compliance rating	Risk Rating
1: Instances of non-compliance with the WEM Rules	Critical: Potential for catastrophic impact on market or system operations or other market outcomes if not addressed immediately. Requires executive actions and monitoring at board level.
2: Findings that are not an instance of non-compliance, but pose compliance risk	Significant: Potential for major impact on market or system operations or other market outcomes if not addressed as a matter of priority. Requires senior management attention with regular monitoring at executive meetings.
3: Findings related to minor housekeeping issues that do not affect compliance risk	Medium: Potential for moderate impact on market or system operations or other market outcomes if not addressed within a reasonable timeframe. Requires management attention with regular monitoring.
	Low: Potential for minor impact on market or system operations or other market outcomes if not addressed in the future. Requires team level attention with regular monitoring.

Materiality (qualification of audit opinion)

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

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

Audit activities

We have undertaken a combination of:

- Reviewing self-reported incidents of AEMO non-compliance with the WEM Rules and Market Procedures
- Business process walkthroughs and interviews with staff

- Reviewing AEMO’s Market Procedures, Internal Procedures¹ and IT Procedures to ensure WEM Rules changes and other changes (e.g. processes, systems, etc.) have been reflected in the procedures
- Compliance testing to audit AEMO’s operational compliance with the WEM Rules and Market Procedures and to determine the effectiveness of operating controls².

The first two activities were conducted as part of our field visit in May 2018. Remaining activities (including review of self-reported incidents arising after our field visit) have been undertaken remotely.

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

Table 4: Audit focus areas

Workstream	Proposed focus area
Electricity Market Operations	Capacity certification/allocation
	Capacity Credit Assignment
	Reserve Capacity Monitoring
	ESOO preparation
	Settlement processing and verification
	Information publication
Electricity System Operations	Reviewing, assessing and incorporating standing data changes
	Dispatch, including: <ul style="list-style-type: none"> • Out of merit dispatch/use of latest BMO • Support for control room tools • Control room operations • Dispatch advisories • Ancillary Service enablement
	Manual preparation of settlement input data and other market data

¹ In some instances, we have reviewed draft versions of Internal Procedures that had not been formally approved as at the time of the audit.

² In doing so, we have sourced information from all AEMO (WA) teams.

	Information publication
	Dispatch planning

AUDIT THEMES AND FINDINGS

Comment

Overall, we found substantial progress made in many areas. Many existing issues remain, but most have a reduced risk. New issues are largely minor, and many relate to the bedding in of new rules and systems.

While the total number of issues remains similar, the number of Significant issues has halved from 4 to 2, and the number of Medium issues has reduced from 18 to 12.

Significant progress addressing risk in critical System Management processes

We are pleased to note considerable progress in several areas where issues have recurred over multiple years.

The massive transition in control room capability has been successfully navigated, with new controllers trained, a security desk function established, and support from historic control room staff almost phased out. Further, the planning team is now carrying out network outage assessments, and no longer relying on Western Power personnel.

Other longstanding issues have progressed, reducing the likelihood of compliance issues, though still have some way to go:

- With the introduction of the security desk, dispatch advisories are being issued more quickly and more consistently
- Work has begun on system management process documentation
- Control room logging is now more extensive
- A very good communications protocol has been agreed with Western Power networks, and is in the process of bedding in
- Business Continuity Plans have been created, and now the focus must move to regular testing

AEMO's IT environment remains complex, and is not projected to become much simpler in the near future

Western Power IT issues continue to disrupt market functions. The causes of individual instances are varied, but there have been multiple instances of file transfer issues and network issues. A fix was put in place for the file transfer issues in September 2017, but disruptive IT issues have continued to occur. The most common impact of these issues is the unavailability of the latest Balancing Merit Order for use in market dispatch, resulting in non-compliances. There have been 6 instances of this in the audit period. In addition, Western Power IT issues have required temporary relocation of control room functions on two occasions. While some progress has been made in identifying and fixing the causes of these issues, they are still causing non-compliances and compliance risk.

Several issues (most self-reported by AEMO) relate to the introduction of the new RCM system in late 2017. This new system implements new Reserve Capacity rules and progresses AEMO's plan for moving away from legacy vendor systems. As with any new system, the initial period following implementation has included identification and correction of several system defects, largely to do with data interfaces between systems. While these teething issues will decrease as time goes on, they illustrate that AEMO's system environment is becoming increasingly complex. Examples of this increasing complexity include:

- The RCM system did not completely replace the existing POMAX settlements system, so that cannot yet be decommissioned
- A new tool for dispatching new facilities under the Generator Interim Access scheme will be introduced soon, adding complexity to the dispatch process
- AEMO has plans to relocate outage, dispatch, and market data management software currently supported by Western Power to its own premises, which will reduce complexity in the infrastructure layer, but improvements to the application layer are some way off.

It is critical that AEMO continue to modernise and refresh systems to reduce this complexity, with clear options to address the legacy issues and systems, even if they are dependent on the path taken in ongoing market reform.

System Management process documentation initiative

One long-recurring issue has been the lack of documentation for System Management processes, including outage management, power system planning, and control room activities. AEMO has now created initial documentation for many of these activities, by engaging dedicated resources.

This is a good start. Over time the documentation suite will need to be improved by:

- Creating an overall structure for the document suite – a taxonomy of procedures
- Clearly defining the difference between procedures and guidelines
- Integrating the existing process flowcharts into the main body of documentation
- Capturing actual activity steps, in addition to the current material which restates rule requirements
- Ensuring draft documents are formally approved

AEMO has plenty of good examples of procedures and work instructions used in the market operations space, and the challenge will be to bring the new System Management documentation to the same level as exists in other areas.

Manual data preparation poses compliance risk

Much of System Management Operations, Governance and Integration (OGI) data preparation process is manual, though generally well-documented in the System Management daily and weekly operations Internal Procedures. Given the manual nature of the processes, it is inevitable that from time to time errors and oversights will occur.

In our view there is still significant scope for removing manual activities in these processes (including 'low hanging fruit'), if OGI resource can be allocated to the task.

Ancillary services monitoring and analysis

AEMO manages ancillary services as part of real-time control room activities. Performance against the standards set by the Rules has historically been monitored and assessed annually.

In this year's annual ancillary services report, AEMO carried out some more extensive analysis of than had been done in the past. The analysis concluded that in a small percentage of intervals, ancillary service standards were not being met on a look-back basis. We are pleased to see a step up in the scope of this analysis, which builds on our analysis from last year's audit.

This year, we analysed AEMO's use of Load Following and Spinning Reserve ancillary services over a sample of two days, and again found some example intervals where AS standards were not met by a small margin.

While there appears to be limited risk of severe system issues as a result, the overall quantum of under-provisioning in any given interval is not clear. We have recommended that AEMO consider

how to gain a better picture of AS performance on a more frequent look-back basis to more quickly identify and correct any issues.

Summary

Table 5 below summarises the total number of audit issues (broken down by risk rating) reported during the 2016/17 and 2017/18 Audit Periods.

Each issue corresponds to one or more non-compliance. Where there is more than one non-compliance of the same nature, we report it as a single issue.

Six issues are associated with the introduction of AEMO's new RCM settlement system. Core calculations are performing correctly, but there have been issues with input data transfers, particularly around the switch over to the new system in November/December.

Most open issues pertain to power system operations and planning (System Management) issues (23 of the 3 open issues), many of which are recurring issues from previous audits.

Table 5: Audit issue summary by risk rating and open/closed status, 2016/17 and 2017/18.

	2016/17 Issues	2017/18 Issues				
Risk Rating	Total	Total	Closed		Open	
			AEMO	RBP	AEMO	RBP
Significant	4	2	0	0	1	1
Medium	18	12	0	2	1	9
Low	30	36	10	3	6	17
Totals	52	49	10	5	8	27
			15		35	

Table 6: Summary of audit issues

Ref	Type & Process	Risk & Compliance Rating	Finding	Recommendation
17WEM1.01	<p>Issue Type</p> <p>RBP reported compliance risk</p> <p>Process</p> <p>SM - Operations, Governance and Integration</p>	<p>Risk Rating</p> <p>Significant</p> <p>Compliance Rating</p> <p>2</p>	<p>Currency of and support for critical control room tools needs more focus.</p>	<ol style="list-style-type: none"> 1. Complete SOCCUI documentation. 2. Ensure these issues are addressed as part of transition of control room software tools from WP to AEMO, including: <ul style="list-style-type: none"> • capturing information about the existing tools • data migration • communication paths • parallel running
17WEM2.04	<p>Issue Type</p> <p>RBP reported non-compliance</p> <p>Process</p> <p>SM - Planning</p>	<p>Risk Rating</p> <p>Low</p> <p>Compliance Rating</p> <p>1</p>	<p>AEMO does not take DSM availability into account when assessing outages.</p>	<p>Review costs/risks/benefits of incorporating DSM availability into outage assessment. If inclusion is decided against, consider proposing a rule change to remediate.</p>
17WEM2.05	<p>Issue Type</p> <p>RBP reported compliance risk</p> <p>Process</p>	<p>Risk Rating</p> <p>Medium</p>	<p>Lack of internal procedures (or business process documentation)</p>	<ol style="list-style-type: none"> 1. Continue to develop and maintain procedure documentation for all business processes.

Ref	Type & Process	Risk & Compliance Rating	Finding	Recommendation
	SM - Operations, Governance and Integration	Compliance Rating 2	poses compliance risk	<p>2. Develop a high-level taxonomy/overview of the procedures</p> <p>3. Ensure all documents receive formal approval, and this is recorded in the documents.</p> <p>4. Define distinction between Procedures and Guidelines and ensure consistent application.</p> <p>5. Integrate flowcharts into formal procedure/guideline documents</p>
17WEM2.06	<p>Issue Type</p> <p>RBP reported compliance risk</p> <p>Process</p> <p>SM - Planning</p> <p>SM - Operations, Governance and Integration</p>	<p>Risk Rating</p> <p>Low</p> <p>Compliance Rating</p> <p>2</p>	Manual process to include transmission outages and potential constraints for MT and ST PASA reports poses risks of omission and errors.	Following transfer of network outage management functions from WP to AEMO, review internal network outage process and identify ways to reduce manual error.
17WEM2.08	<p>Issue Type</p> <p>AEMO reported non-compliance</p> <p>Process</p>	<p>Risk Rating</p> <p>Significant</p> <p>Compliance</p>	Not using latest BMO due to IT systems issues	Continue to investigate, determine root causes, and apply fixes for each failure.

Ref	Type & Process	Risk & Compliance Rating	Finding	Recommendation
	SM - Operations, Governance and Integration	Rating 1		
17WEM2.11	Issue Type RBP reported compliance risk Process SM - Operations, Governance and Integration	Risk Rating Medium Compliance Rating 3	There is room to better align the dispatch process with market objectives around economic efficiency	No current action. In the long term, market dispatch timing will be addressed as part of market reform.
17WEM2.13	Issue Type RBP reported compliance risk Process SM - Power System operations	Risk Rating Medium Compliance Rating 2	System Management's dispatch decisions around Synergy plant are opaque	1. Ensure that electronic logbook guidelines are followed consistently 2. Update the guidelines to ensure reasoning for dispatch decisions is captured: Define 'normal' and a defined set of 'abnormal' dispatch decisions. Update guidelines such that each dispatch decision is identified with the type of decision being followed.
17WEM2.14	Issue Type RBP reported compliance risk	Risk Rating Low Compliance	There is opportunity to improve the	Ensure that electronic logbook guidelines are followed consistently

Ref	Type & Process	Risk & Compliance Rating	Finding	Recommendation
	Process SM - Power System operations	Rating 2	audit trail of control room operations	
17WEM2.15	Issue Type RBP reported non-compliance Process SM - Power System operations	Risk Rating Low Compliance Rating 1	RDQ forecasts prepared by AEMO do not always reflect best estimate of forecast load	Either: 1. Investigate a mechanism to capture and publish the actual load forecast used in the control room. OR 2. Investigate improvements to published load forecast to reduce need to manually override
17WEM2.16	Issue Type RBP reported non-compliance Process SM - Operations, Governance and Integration	Risk Rating Low Compliance Rating 1	SM does not publish updates to the ST PASA when material changes occur	Following transfer of network outage planning function to AEMO, review usefulness of PASA information to participants, refine reports to provide better match with what participants need, investigate automatic publication. In the meantime, continue with current ST-PASA publication approach.
17WEM2.17	Issue Type RBP reported non-compliance	Risk Rating Low Compliance	SM does not publish transmission constraint	Medium term: Following transfer of Western Power software tools to AEMO, review usefulness of PASA information to participants, refine

Ref	Type & Process	Risk & Compliance Rating	Finding	Recommendation
	Process SM - Planning	Rating 1	information in PASA	reports to provide better match with what participants need, investigate automatic publication.
17WEM2.18	Issue Type RBP reported Process SM - Operations, Governance and Integration	Risk Rating Low Compliance Rating 3	SCADA data cleansing processes remove consumption data.	Update Cleansing of Generation Facility MWh output data guidelines to reflect all data cleansing steps.
17WEM2.20	Issue Type RBP reported non-compliance Process SM - Planning	Risk Rating Low Compliance Rating 1	Dispatch Plan and associated Information provided to Synergy does not include specified ancillary service information, and the format and time resolution is not described in a procedure.	<ol style="list-style-type: none"> 1. Standardize Dispatch Plan creation process and describe in a procedure. 2. Alter dispatch plan preparation process to remove reliance on sheet containing confidential information
17WEM2.21	Issue Type	Risk Rating Low Compliance	Verbal dispatch instructions are not	Ensure that electronic logbook guidelines are followed consistently.

Ref	Type & Process	Risk & Compliance Rating	Finding	Recommendation
	RBP reported compliance risk Process SM - Power System operations	Rating 2	automatically recorded in IT systems	
17WEM2.22	Issue Type RBP reported compliance risk Process SM - Power System operations	Risk Rating Medium Compliance Rating 2	Control room business continuity plans do not include continuous oversight of power system, and IT system disaster recovery plans are not sufficient	1. Implement plan to allow remote access to control room tools once they come in-house. 2. Schedule and carry out regular BCP plans.
17WEM2.23	Issue Type RBP reported compliance risk Process Various	Risk Rating Low Compliance Rating 2	PSOPs out of date	Continue to update the PSOPs to reflect the various organisational changes, including publication obligations.
17WEM2.40	Issue Type	Risk Rating Low Compliance	Business continuity exercises are	1. Plan and conduct regular desk-based and live business continuity

Ref	Type & Process	Risk & Compliance Rating	Finding	Recommendation
	RBP reported compliance risk Process Various	Rating 2	limited to system failovers	exercises covering selected credible contingency scenarios 2. Consider how to notify participants of BCP execution before not after the situation has been resolved.
17WEM2.42	Issue Type RBP reported compliance risk Process SM - Operations, Governance and Integration	Risk Rating Medium Compliance Rating 2	Market operations data preparation processes are heavily manual.	1. Assess opportunities for automating to reduce manual effort and reduce errors. In particular, automate: <ul style="list-style-type: none"> • preparation of the ancillary service activation quantities • calculation of outage quantities for intermittent generators 2. Standardise manual entry format for non-compliance notifications to simplify subsequent processes 3. Lock key spreadsheet tools and add to source control 4. Implement timestamping on manually amended database tables
17WEM2.51	Issue Type RBP reported non-compliance	Risk Rating Low Compliance	Lack of clarity over correct temperature for maximum facility	1. Once rule change is complete, work with the Market Operations team to investigate whether the value under Appendix 1(b)iii (the

Ref	Type & Process	Risk & Compliance Rating	Finding	Recommendation
	<p>Process</p> <p>SM - Operations, Governance and Integration</p>	<p>Rating</p> <p>2</p>	<p>capacity under Appendix 1(b)iii</p>	<p>sent-out capacity of the generator, expressed in MW) should all be 15 degrees and update the WEM Registration Technical Guide.</p> <p>2. Then ensure all capacity data is compliant.</p>
18WEM1.01	<p>Issue Type</p> <p>RBP reported compliance risk</p> <p>Process</p> <p>Information technology</p>	<p>Risk Rating</p> <p>Medium</p> <p>Compliance Rating</p> <p>2</p>	<p>Settlement processes using new RCM systems have increased complexity of process and systems</p>	<p>Ensure legacy system retirement and remediation is explicitly included in plans for WEM system evolution</p>
18WEM1.02	<p>Issue Type</p> <p>RBP reported non-compliance</p> <p>Process</p> <p>WA Market Operations</p>	<p>Risk Rating</p> <p>Low</p> <p>Compliance Rating</p> <p>1</p>	<p>AEMO is not publishing REPO Count information</p>	<p>Include this software change in an upcoming release.</p>
18WEM1.03	<p>Issue Type</p> <p>RBP reported non-compliance</p>	<p>Risk Rating</p> <p>Low</p> <p>Compliance</p>	<p>PSOP: Dispatch does not include required information for</p>	<p>Update the PSOP to give more information on the methodology for</p>

Ref	Type & Process	Risk & Compliance Rating	Finding	Recommendation
	Process SM – Operations, Governance and Integration	Rating 1	DSP real-time consumption data	getting real-time consumption data from DSPs.
18WEM1.04	Issue Type RBP reported non- compliance Process Reserve Capacity	Risk Rating Low Compliance Rating 1	Not publishing assessment of whether to conduct a Value of Customer Response study specific to WA	No further action.
18WEM1.05	Issue Type RBP reported compliance risk Process Reserve Capacity	Risk Rating Medium Compliance Rating 2	Improvements to Capacity Certification process	No further action
18WEM1.06	Issue Type RBP reported compliance risk Process All	Risk Rating Low Compliance Rating 2	Reference to outdated version of Rules	Ensure hard copy Rules are replaced or retired when superseded by significant changes, for example, by ensuring relevant team members are receiving rule change update notifications.

Ref	Type & Process	Risk & Compliance Rating	Finding	Recommendation
18WEM1.07	<p>Issue Type</p> <p>RBP reported non-compliance</p> <p>Process</p> <p>SM - Operations, Governance and Integration</p>	<p>Risk Rating</p> <p>Low</p> <p>Compliance Rating</p> <p>1</p>	Late issuance of Dispatch Advisories	No further action.
18WEM1.08	<p>Issue Type</p> <p>RBP reported non-compliance</p> <p>Process</p> <p>SM - Planning</p>	<p>Risk Rating</p> <p>Medium</p> <p>Compliance Rating</p> <p>1</p>	Under provisioning of ancillary services	<ol style="list-style-type: none"> Analyse characteristics of situations with a Spinning Reserve shortfall to understand risk levels Assess LFAS Requirement according to 3.10.1 standard, in addition to forecast error method. Consider how to get view of AS performance and risk on a more frequent basis than annually.
18WEM1.09	<p>Issue Type</p> <p>RBP reported non-compliance</p> <p>Process</p> <p>SM - Operations, Governance and Integration</p>	<p>Risk Rating</p> <p>Low</p> <p>Compliance Rating</p> <p>1</p>	Incorrect Ancillary Service contract payments	No further action. AEMO has corrected the calculation.

Ref	Type & Process	Risk & Compliance Rating	Finding	Recommendation
18WEM1.10	<p>Issue Type RBP reported compliance risk</p> <p>Process SM - Power System operations</p>	<p>Risk Rating Low</p> <p>Compliance Rating 2</p>	Inconsistent application of control room log guidelines.	Review log sheets from each controller on regular basis to ensure consistent application of logging guideline.
18WEM1.11	<p>Issue Type RBP reported compliance risk</p> <p>Process SM - Power System operations</p>	<p>Risk Rating Medium</p> <p>Compliance Rating 2</p>	Communications protocol with Western Power not being followed	<ol style="list-style-type: none"> 1. Ensure that controllers practice communication using the protocol 2. Monitor to ensure consistent application.
18WEM1.12	<p>Issue Type AEMO reported non-compliance</p> <p>Process Information technology</p>	<p>Risk Rating Low</p> <p>Compliance Rating 1</p>	Release of settlement software without independent certification	<ol style="list-style-type: none"> 1. Recruit and train sufficient resources to meet current and near future needs, with urgency. 2. Regression test and arrange independent certification of POMAX as soon as possible. 3. Test GIA software as soon as possible.
18WEM1.13	<p>Issue Type AEMO reported non-compliance</p>	<p>Risk Rating Low</p> <p>Compliance Rating</p>	Failure to provide forecast for spare	Update the Market Procedure to capture this information

Ref	Type & Process	Risk & Compliance Rating	Finding	Recommendation
	Process WA Market Operations	Rating 1	capacity for Trading Interval (RCM-related)	
18WEM1.14	Issue Type AEMO reported non-compliance Process WA Market Operations	Risk Rating Low Compliance Rating 1	Incorrect interest rate applied to non-STEM settlement adjustments	No further action.
18WEM1.15	Issue Type AEMO reported non-compliance Process WA Market Operations	Risk Rating Low Compliance Rating 1	Failure to notify Market Participant by Capacity Over Allocation deadline (RCM-related)	No further action
18WEM1.16	Issue Type AEMO reported non-compliance Process Finance	Risk Rating Low Compliance Rating 1	Failure to pay interest accrued on Security Deposits to Market Participants	1. Include the monthly interest payment process in internal procedure documentation 2. Implement a reminder mechanism e.g. on a shared calendar.

Ref	Type & Process	Risk & Compliance Rating	Finding	Recommendation
18WEM1.17	<p>Issue Type AEMO reported non-compliance</p> <p>Process WA Market Operations</p>	<p>Risk Rating Low</p> <p>Compliance Rating 1</p>	Use of incorrect input data in NTDL assessment	No further action
18WEM1.18	<p>Issue Type AEMO reported non-compliance</p> <p>Process WA Market Operations</p>	<p>Risk Rating Low</p> <p>Compliance Rating 1</p>	Late notification to Market Participants of Capacity Credits accepted as submitted (RCM-related)	No further action
18WEM1.19	<p>Issue Type AEMO reported non-compliance</p> <p>Process WA Market Operations</p>	<p>Risk Rating Low</p> <p>Compliance Rating 1</p>	Incorrect calculation of Ancillary Service settlement amounts for October and November 2017 (RCM-related)	Consider a rule change proposal to extend the list of data changes that can trigger a settlement adjustment.
18WEM1.20	<p>Issue Type AEMO reported non-compliance</p>	<p>Risk Rating Low</p> <p>Compliance</p>	Incorrect calculation of constrained on	Consider a rule change proposal to extend the list of data changes that can trigger a settlement adjustment.

Ref	Type & Process	Risk & Compliance Rating	Finding	Recommendation
	Process WA Market Operations	Rating 1	and off amounts for October 2017	
18WEM1.21	Issue Type AEMO reported non-compliance Process WA Market Operations	Risk Rating Low Compliance Rating 1	Incorrect calculation of Facility Capacity Rebate for October 2017 (RCM-related)	No further action
18WEM1.22	Issue Type AEMO reported non-compliance Process WA Market Operations	Risk Rating Low Compliance Rating 1	Incorrect Margin Peak value used in April 2018 initial settlement	Consider amending process so that parameters that change annually are entered for all months at the same time once a year, rather than each month as is current practice.
18WEM1.23	Issue Type AEMO reported non-compliance Process	Risk Rating Medium Compliance Rating 1	Failure to prepare dispatch volumes for non-scheduled generators receiving a	1. Review dispatch instruction and calculated dispatch volume data to determine the extent of the problem. 2. Develop a system or procedure to ensure that all instances of a non-

Ref	Type & Process	Risk & Compliance Rating	Finding	Recommendation
	SM – Operations, Governance and Integration		dispatch instruction	scheduled generator receiving a dispatch instruction are processed in a manner that is not vulnerable to human oversight.
18WEM1.24	Issue Type AEMO reported non-compliance Process SM - Power System Operations	Risk Rating Low Compliance Rating 1	Dispatch instruction issued with ramp rate in excess of standing data ramp rate	No further action
18WEM1.25	Issue Type AEMO reported non-compliance Process SM - Power System Operations	Risk Rating Low Compliance Rating 1	Failure to issue warning beyond automated one-minute non-compliance notification	No further action
18WEM1.26	Issue Type AEMO reported non-compliance Process	Risk Rating Low Compliance Rating 1	Load forecast not sent to Synergy	No separate action – refer to 17WEM2.08 regarding Western Power IT issues.

Ref	Type & Process	Risk & Compliance Rating	Finding	Recommendation
	SM - Operations, Governance and Integration			
18WEM1.27	<p>Issue Type</p> <p>AEMO reported non-compliance</p> <p>Process</p> <p>SM - Operations, Governance and Integration</p>	<p>Risk Rating</p> <p>Low</p> <p>Compliance Rating</p> <p>1</p>	Tolerance Range not applied to non-scheduled generators	No further action
18WEM1.28	<p>Issue Type</p> <p>RBP reported compliance risk</p> <p>Process</p> <p>SM - Operations, Governance and Integration</p>	<p>Risk Rating</p> <p>Medium</p> <p>Compliance Rating</p> <p>2</p>	Non-issuance of Dispatch Advisories in case of facility outage	<p>1. Consider an appropriate threshold for generator outages above which to issue a Dispatch Advisory.</p> <p>2. Amend Dispatch Advisory guidelines to include publication of all generator outages over the threshold</p>
18WEM1.29	<p>Issue Type</p> <p>AEMO reported non-compliance</p> <p>Process</p>	<p>Risk Rating</p> <p>Low</p> <p>Compliance Rating</p> <p>1</p>	Incorrect calculation of Facility Refunds for October and November 2017 (RCM-related)	No further action

Ref	Type & Process	Risk & Compliance Rating	Finding	Recommendation
	WA Market Operations			
18WEM1.30	<p>Issue Type AEMO reported non-compliance</p> <p>Process WA Market Operations</p>	<p>Risk Rating Low</p> <p>Compliance Rating 1</p>	Incorrect calculation of Reserve Capacity Obligation Quantities (RCM-related)	Continue to investigate options to correct the RCOQ values
18WEM1.31	<p>Issue Type RBP reported compliance risk</p> <p>Process SM - Operations, Governance and Integration</p>	<p>Risk Rating Medium</p> <p>Compliance Rating 2</p>	Currency of and support for critical control room tools has been an issue in the past (see finding 17WEM1.01) and will need to continue to be addressed as part of transition of control room software tools from WP to AEMO.	<p>Ensure these issues are addressed as part of transition of control room software tools from WP to AEMO, including:</p> <ul style="list-style-type: none"> • capturing information about the existing tools • data migration • communication paths <p>parallel running</p>

OPINION

Qualifications

We have noted two instances of material non-compliance with the WEM Rules; our definition of materiality is set out on page 7:

- **18WEM1.08:** The Load Rejection reserve (LRR) standard, as defined by clause 3.10.4 of the WEM rules was not met 6.5% of the time. There were no cases where the non-compliance coincided with a significant load rejection contingency event, but had one occurred at these times, the power system would have been less able to cope with a loss of load contingency, increasing the likelihood of equipment damage. This was in part due to conscious decisions on the part of control room personnel to provision less LRR than strictly required, and staff have been retrained. We do not expect this to occur in future.
- **17WEM2.08:** Due to IT issues, System Management has dispatched other than from the latest Balancing Merit Order (BMO) on several occasions, which is not compliant with clauses 7.6.1C and 7.6.1D of the WEM Rules. In these situations, AEMO is not sure to be dispatching the lowest cost combination of generators to meet demand, and the affected generators will receive additional constrained on or off payments as a result, increasing the overall costs to market participants. AEMO is aware of these issues, self-reports non-compliance for each occurrence, and has a medium-term plan to fix underlying problems by removing reliance on Western Power infrastructure. We expect these issues to recur until the System Management Systems Transition project is completed in mid-2019.

Conclusion

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

Subject to the inherent limitations set out in Section 1.5.4 and with the exception of the instances 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 AEMO has not been compliant with the WEM Rules and Market Procedures during the Audit Period, in all material respects.

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

Subject to the inherent limitations set out in Section 1.5.4, based on the audit procedures we have performed and the evidence we have examined, AEMO's Market Software Systems are compliant with the WEM Rules in all material respects.

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

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

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1 INTRODUCTION

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

1.1 AUDITED ENTITY

The audited entity for this report is AEMO.

1.2 AUDIT PERIOD

The Audit Period is 1 July 2017 to 30 June 2018, both dates inclusive.

1.3 REGULATORY CONTEXT AND SCOPE

1.3.1 Regulatory context

The regulatory context for the audit is summarised in the table below. For avoidance of doubt, the heads of power for the Electricity Compliance Audit are derived from clauses 2.14.1, 2.14.2 & 2.14.3 of the WEM Rules and covers AEMO's role as both market operator and system operator.

Table 7: Regulatory context for the market 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, at minimum: <ul style="list-style-type: none">• The compliance of AEMO's Internal Procedures and business processes with the WEM Rules.• AEMO's compliance with the WEM Rules and Market Procedures.• The compliance of AEMO's market software systems and processes for software management with clause 2.36.1 of the WEM Rules.
2.36.1	Defines obligations with respect to AEMO's software management systems and controls; this provides the compliance criteria for the review of processes for software management.

1.3.2 Scope

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

- How AEMO implements its obligations under the WEM Rules.
- How AEMO manages non-compliance risk with respect to the obligations above.
- Instances of non-compliance by AEMO during the Audit Period.
- AEMO's market software systems and its processes for software management, and specifically, AEMO's compliance with clause 2.36.1 of the WEM Rules. It includes an assessment of whether:
 - AEMO maintains appropriate records.
 - The software used by AEMO to implement its obligations under WEM Rules is compliant with the underlying mathematical formulations and the rules themselves.
 - AEMO has been compliant with its market systems certification obligations.
 - AEMO can reproduce past results.

The Electricity Compliance Audit includes AEMO's role as both market and system operator and includes the following work streams within scope:

- **Compliance Assessment** of:
 - Areas where we have noted breaches or non-compliance risk during past audits.
 - Areas that have changed or been introduced in the past Audit Period (e.g. in terms of rule changes, system changes, operational practice changes).
 - AEMO's self-reported instances of non-compliance with the WEM Rules.
 - Areas of potential risk identified by Market Participants during the Stakeholder Session on 23 March 2017.
- **Procedures Assessment** of Market Procedures and Internal Procedures that have changed during the Audit Period.
- **Software Compliance Assessment.** Our audit team has tested and certified updates to WEMS and settlements systems on an ad-hoc basis throughout the year (prior to implementation). Hence the Software Compliance Assessment does not include certification testing but does include:
 - A review of AEMO's change logs for WEMS, settlements, SPARTA, RTDE and SOCCUI
 - A review of rule changes and release notes to determine whether all rule changes have been reflected in software

- Testing compliance of MR 2.36.1(b) in respect of the October 2017 initial NSTEM settlement run to check whether AEMO can recreate system outputs

1.4 AUDIT CRITERIA

1.4.1 Criteria for determining operational and procedural compliance

The criterion we have used for determining the compliance of AEMO’s Market Procedures (referred to as the *Market Procedures*) is the Wholesale Electricity Market Rules dated 27 March 2018 (referred to as the *WEM Rules*).

The criteria we have used for determining AEMO’s operational compliance and the compliance of AEMO’s Internal Procedures are the WEM Rules and the Market Procedures.

1.4.2 Criteria for determining control application

When assessing whether AEMO has applied effective controls during the Audit Period we have used relevant Internal Procedure and Confluence Work Instruction documentation as our audit criteria. These are summarised below.

Table 8: Procedures reviewed to assess control application

AEMO functional area	Procedures against which control application has been assessed
Market Operations	Daily Operations Procedure, Prudential Requirements Procedure, Settlements Procedure and Confluence work instructions relating to Annual Loss Factor Review and NSTEM and STEM verification, billing and invoicing procedures
Reserve Capacity	Certification Procedure and Preparation of ESOO Procedure
Finance	Determination of AEMO Budget Procedures and Fees Procedure
System Management Operations Governance and Integration	Daily Market Operations Procedure, Daily Market Operations Contingency and Backup Procedure, Weekly Ad-hoc Market Operations Procedure, Dispatch Advisory Guidelines, Dispatch Advisory Software User Guide
System Management System Operations	SOCC_UI Operation Manual, SWIS Technical Envelope
System Management Planning	MetrixIDR Technical Guide
IT	IT Change Management Policy, Software Configuration Management Plan

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

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

1.5 APPROACH

1.5.1 Assurance

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

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

1.5.2 Risk ratings and materiality

Compliance and risk ratings

Audit findings are categorised as follows:

Table 9: Compliance and risk ratings

Compliance rating	Risk Rating
1: Instances of non-compliance with the WEM Rules	Critical: Potential for catastrophic impact on market or system operations or other market outcomes if not addressed immediately. Requires executive actions and monitoring at board level.
2: Findings that are not an instance of non-compliance, but pose compliance risk	Significant: Potential for major impact on market or system operations or other market outcomes if not addressed as a matter of priority. Requires senior management attention with regular monitoring at executive meetings.
3: Findings related to minor housekeeping issues that do not affect compliance risk	Medium: Potential for moderate impact on market or system operations or other market outcomes if not addressed within a reasonable timeframe. Requires management attention with regular monitoring.
	Low: Potential for minor impact on market or system operations or other market outcomes if not addressed in the future. Requires team level attention with regular monitoring.

Risk rating descriptors for audit findings are based on AEMO’s corporate risk matrix. The only difference from AEMO’s internal ratings is that we assess the financial impact to market participants in addition to AEMO.

Please refer to Section 15.1 for more information.

Materiality (qualification of audit opinion)

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

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

1.5.3 Audit activities

We have undertaken a combination of:

- Reviewing self-reported incidents of AEMO non-compliance with the WEM Rules and Market Procedures
- Business process walkthroughs and interviews with staff to audit the application of operating controls and to determine the level of compliance risk associated with selected business processes
- Reviewing AEMO's Market Procedures, Internal Procedures³ and IT Procedures to ensure WEM Rules changes and other changes (e.g. processes, systems, etc.) have been reflected in the procedures
- Compliance testing to audit AEMO's operational compliance with the WEM Rules and Market Procedures and to determine the effectiveness of operating controls. In doing so, we have sourced information from all AEMO (WA) teams, with a particular emphasis on the Market Operations team.
- The first two activities were conducted as part of our field visit in May 2018. Remaining activities (including review of self-reported incidents arising after our field visit) have been undertaken remotely.

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

- Electricity Market Operations
 - Capacity certification/allocation
 - Capacity Credit Assignment
 - Reserve Capacity Monitoring
 - ESOO preparation
 - Settlement processing and verification
 - Information publication
- Electricity System Operations

³ In some cases we have reviewed draft versions of Internal Procedures that had not been formally approved as at the time of the review.

- Reviewing, assessing and incorporating standing data changes
- Dispatch, including:
 - Out of merit dispatch/use of latest BMO
 - Support for control room tools
 - Control room operations
 - Dispatch advisories
 - Ancillary Service enablement
- Manual preparation of settlement input data and other market data
- Information publication
- Dispatch planning

1.5.4 Inherent limitations

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

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

A market audit does not guarantee every procedure and action carried out in the operation of the 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 WEM Rules and Market Procedures is therefore subject to the following caveats:

- Our audit procedures did not include assessing irregularities such as fraudulent or illegal activities. As such, our audit should not be relied upon to disclose such irregularities. However, 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.
- Our audit is not designed to detect all weaknesses in control procedures as it is not performed continuously throughout the Audit Period and is performed on a sample basis.

1.6 STRUCTURE OF THIS REPORT

The remainder of this report is structured as follows:

- Chapters 2 to 13 present our audit findings relating to the Compliance Assessment and Procedures Assessment work streams on an WEM Rule chapter by chapter basis.
- Chapter 14 presents findings relating to AEMO's electricity market software.

1.7 ACKNOWLEDGMENTS

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

2 WEM RULES CHAPTER 1 - INTRODUCTION

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

2.1 RULE AMENDMENTS

There have been transitional changes to Chapter 1 of the WEM Rules to reflect amendments to timelines for the 2016, 2017 and 2018 Reserve Capacity Cycles, and the winding up of the Independent Market Operator (IMO).

2.2 AEMO PROCEDURES

AEMO's Internal Procedures are compliant with Chapter 1 of the WEM Rules in all material respects.

2.3 COMPLIANCE WITH CHAPTER 1

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

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

3 WEM RULES CHAPTER 2 - ADMINISTRATION

Chapter 2 of the WEM 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 RULE AMENDMENTS

Amendments to Chapter 2 reflect:

- Removal of references to the IMO
- Explicit mention of AEMO's role in supporting rule changes
- New powers for AEMO (in its System Management role) to request information and direct facilities
- New standing data for Demand Side Programmes

3.2 AEMO PROCEDURES

AEMO's Internal Procedures are compliant with Chapter 2 of the WEM Rules in all material respects.

3.2.1 Market Procedures (including the PSOP)

We have noted two issues that are not instances of non-compliance:

- The process of updating the PSOPs is still in progress to reflect the transfer of functions from the IMO and Western Power, to AEMO, ERA and the Rule Change Panel. This is not a breach as clause 1.19.3 provides for transitional roles of the IMO, ERA and AEMO. This applies to all rule chapters, not just chapter 2.
- We have noted a small number of obligations that are not documented in Market Procedures.

3.2.2 Internal Procedures

As noted in previous years, many of System Management's (SM) business processes were undocumented. AEMO have made significant progress in creating and updating process

documentation, with a specific role assigned to developing this documentation, however documentation of control room activities and PSOPs are still in progress. Therefore, the potential for inconsistent processes still remains.

AEMO’s non-SM procedures have largely been updated to reflect rule changes during the year, though there are still undocumented obligations relating to Finance and Market Development processes, largely due to changes in those teams through the year.

Except for the issues noted above, AEMO’s Internal Procedures are compliant with the WEM Rules.

3.2.3 Compliance of AEMO’s procedures with the WEM Rules

Audit findings related to the compliance of AEMO’s procedures are summarised below:

Table 10: Findings associated with AEMO’s internal procedures

Ref	Finding	Risk & Compliance Rating	Recommendation
17WEM2.05	<p>Lack of internal procedures (or business process documentation) poses compliance risk</p> <p>As noted in previous years, many of System Management’s business processes were undocumented.</p> <p>AEMO have made significant progress, with a specific role assigned to developing this documentation, however documentation of control room activities and PSOPs are still in progress.</p> <p>This work has resulted in a large number of documents without an overall structure - A high-level taxonomy should be created to identify the correct document for a given obligation or process.</p> <p>Most of the documents reviewed by us have a "Not Approved" status.</p> <p>Some documentation has been developed as 'guidelines', and some as 'procedures' - a clear distinction and</p>	Medium Level 2	<ol style="list-style-type: none"> 1. Continue to develop and maintain procedure documentation for all business processes. 2. Develop a high-level taxonomy/overview of the procedures 3. Ensure all documents receive formal approval, and this is recorded in the documents. 4. Define distinction between Procedures and Guidelines and ensure consistent application. 5. Integrate flowcharts into formal procedure/guideline documents

Ref	Finding	Risk & Compliance Rating	Recommendation
	<p>rationale for using guidelines rather than procedures needs to be defined.</p> <p>Some documentation is in the form of flow charts separate from a procedure or guideline document.</p> <p>Some existing procedures still need to be updated.</p>		
17WEM2.23	<p>PSOPs out of date</p> <p>Some PSOPs have not been updated to reflect recent rule changes. Progress has been made, and a resource has been dedicated to updating procedures, but this is still a work in progress.</p>	Low Level 2	Continue to update the PSOPs to reflect the various organisational changes, including publication obligations.

3.3 OPERATIONAL COMPLIANCE WITH CHAPTER 2

3.3.1 Audit activities

- We have conducted (retrospective) business process walkthroughs to determine whether AEMO has complied with the WEM Rules and its Internal Procedures and whether AEMO has applied appropriate controls in the following areas:
 - reviewing, assessing and incorporating standing data changes.

3.3.2 Audit findings

Instances of non-compliance and areas of compliance risk associated with Chapter 2 of the WEM Rules are summarised in the table below.

Table 11: Operational compliance findings associated with Chapter 2 of the WEM Rules

Ref	Issue Type & Obligation	Risk & Compliance Ratings	Finding	Recommendation
18WEM1.06	<p>Issue Type</p> <p>RBP reported compliance risk</p>	<p>Risk Rating</p> <p>Low</p> <p>Compliance Rating</p> <p>2</p>	<p>Reference to outdated version of Rules</p> <p>We noted one analyst referring to a hard copy of the Market Rules dated Nov 2015, which predates significant changes to the rules, including AEMO's assumption of SM functions and changes to the reserve capacity mechanism.</p> <p>In some cases, retaining past Rules versions may be necessary (e.g. where settlement adjustments are still being carried out under historic rules), but generally reference should be to recent version.</p>	<p>Ensure hard copy Rules are replaced or retired when superseded by significant changes, for example, by ensuring relevant team members are receiving rule change update notifications.</p>
18WEM1.16	<p>Issue Type</p> <p>AEMO reported non-compliance</p> <p>Obligation</p> <p>2.43.1, 4.13.6</p>	<p>Risk Rating</p> <p>Low</p> <p>Compliance Rating</p> <p>1</p>	<p>Failure to pay interest accrued on Security Deposits to Market Participants</p> <p>MR 2.43.1 requires AEMO to develop and follow a market procedure dealing with processes for prudential security.</p> <p>Clause 3.12.2 of the Market Procedure: Prudential Requirements requires AEMO to pay interest earned on prudential security to Market Participants on a monthly basis.</p> <p>MR 4.13.6 requires AEMO to pay interest earned on reserve capacity security deposits on a monthly basis.</p> <p>Due to human errors, AEMO did not pay interest to:</p>	<ol style="list-style-type: none"> 1. Include the monthly interest payment process in internal procedure documentation 2. Implement a reminder mechanism e.g. on a shared calendar.

			<ul style="list-style-type: none"> • any Market Participant in the month of September 2017 • one Market Participant in the months of November through February <p>Interest has now been paid, including compounded interest on the amounts not paid.</p>	
18WEM1.27	<p>Issue Type AEMO reported non-compliance</p> <p>Obligation 2.13.6D</p>	<p>Risk Rating Low</p> <p>Compliance Rating 1</p>	<p>Tolerance Range not applied to non-scheduled generators</p> <p>MR 2.13.6D allows SM to determine the Tolerance Range to apply to all facilities for the purpose of reporting alleged breaches of clauses 7.10.1 and 3.21 to the ERA under clause 2.13.6A. Historically, SM has only done this for scheduled generators. Non-scheduled generators have been able to request a facility tolerance where required. AEMO has determined that it is the intent of the clause to apply it to all generators.</p> <p>A Tolerance Range PSOP has been created, and MR 2.13.6D will be applied to all generators from the 2018 annual review of tolerance ranges.</p>	No further action

4 WEM RULES CHAPTER 3 – POWER SYSTEM SECURITY AND RELIABILITY

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

4.1 RULE AMENDMENTS

Amendments to Chapter 3 of the WEM Rules include:

- Minor administrative changes to clarify rule intent.
- Addition to the definition of Forced Outage

4.2 AEMO PROCEDURES

AEMO's Internal Procedures are compliant with Chapter 3 of the WEM Rules in all material respects.

4.3 OPERATIONAL COMPLIANCE WITH CHAPTER 3

4.3.1 Audit activities

- We have conducted business process observation and walkthroughs to determine whether AEMO has complied with the WEM Rules and its Internal Procedures and whether AEMO has applied appropriate controls in the following areas:
 - Preparation of MT-PASA (clause 3.16 of the WEM Rules).
 - Preparation of ST PASA (clause 3.17 of the WEM Rules).
 - Outage acceptance and approval (clauses 3.18 and 3.19 of the WEM Rules).
 - Manual preparation of settlement input data and other market data.
- We have conducted compliance testing on:

- Content and timing of MT-PASA.
- Content and timing of ST PASA.
- Manual preparation of settlement input data and other market data.
- Ancillary service activation for SR and LFAS
- Non-compliance notifications to generation facilities

4.3.2 Audit findings

Instances of non-compliance and areas of compliance risk associated with Chapter 3 of the WEM Rules are summarised in the table below.

Table 12: Operational compliance findings associated with Chapter 3 of the WEM Rules

Ref	Issue type & obligation	Risk & Compliance Ratings	Finding	Recommendation
17WEM2.04	<p>Issue Type RBP reported non-compliance (Recurring issue)</p> <p>Obligation 3.18.11(a)</p>	<p>Risk Rating Low</p> <p>Compliance Rating 1</p>	<p>AEMO does not take DSM availability into account when assessing outages.</p> <p>Clauses 3.18.11 and 3.19.6 require 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. In our view this is not a 'reasonable forecast of total available demand side management'. This treatment arises from the difficulty of using DSM in practice – DSM may only be dispatched as a last resort, requires a four-hour notice period, and would typically only be dispatched in summer. Most facilities schedule long-duration outages in the off-peak/shoulder months. Because the market has significant overcapacity, the omission of DSM as part of the outage approval process is unlikely to result in different outage decisions, and we have seen no evidence that any outage decision would have been different if DSM were accounted for. Therefore, this breach is likely to have negligible impact on market outcomes. Nevertheless, with recent rule changes to make DSM treatment more comparable to generation, it is more usable, and there is potential for outage decisions to be affected in future.</p>	<p>Review costs/risks/benefits of incorporating DSM availability into outage assessment. If inclusion is decided against, consider proposing a rule change to remediate.</p>

Ref	Issue type & obligation	Risk & Compliance Ratings	Finding	Recommendation
			<p>AEMO have prepared a document that described the rationale for not taking DSM into account – at the pre-October 2017 level of DSM availability, DSM fits within the margin of error of forecasts. However, this same document also recommends considering DSM after October 2017, once DSM availability is extended to 200 hours.</p>	
17WEM2.06	<p>Issue Type RBP reported non-compliance (Recurring issue)</p> <p>Obligation 3.17.9(f)</p>	<p>Risk Rating Low</p> <p>Compliance Rating 2</p>	<p>Manual process to include transmission outages and potential constraints for MT and ST PASA reports poses risks of omission and errors.</p> <p>Last year’s finding:</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 the Network Operator Interface, and manually checks them against the Equipment List (as network outages are entered using a free text field, and Western Power Networks personnel sometimes use different labels to identify transmission equipment). 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 note that SM has taken over the outage management system for network operations, and this provides an opportunity to reduce potential for manual error, by, for example removing free text fields and standardising equipment labelling nomenclature.</p>	<p>Following transfer of network outage management functions from WP to AEMO, review internal network outage process and identify ways to reduce manual error.</p>

Ref	Issue type & obligation	Risk & Compliance Ratings	Finding	Recommendation
			<p>Update: AEMO responded that it would be premature to commit to specific improvements prior to the establishment and embedment of the new outage management process. Therefore, this is still an ongoing issue.</p> <p>AEMO have updated the Transmission Outages template to automatically check against the equipment list. All participants do have access to transmission outage data via the MPI.”</p>	
17WEM2.16	<p>Issue Type RBP reported non-compliance (Recurring issue)</p> <p>Obligation 3.17.1</p>	<p>Risk Rating Low</p> <p>Compliance Rating 1</p>	<p>SM does not publish updates to the ST PASA when material changes occur</p> <p>Clause 3.17.1(b) requires SM to update and publish the ST PASA if changes occur that would materially affect market outcomes during the first week of the ST PASA. No updates have been published in the audit period. A version of the ST-PASA spreadsheet tool is also used by SOPEs in outage assessment, using automatically refreshed data, but these updates are not published to the market.</p> <p>Most of the information in the ST-PASA is available to market participants, but transmission outages, and 1st and 2nd standard deviation load forecasts are not available except in the PASA.</p>	<p>Following transfer of network outage planning function to AEMO, review usefulness of PASA information to participants, refine reports to provide better match with what participants need, investigate automatic publication. In the meantime, continue with current ST-PASA publication approach.</p>
17WEM2.17	<p>Issue Type RBP reported non-compliance (Recurring issue)</p> <p>Obligation 3.16.9(f); 3.17.9(f)</p>	<p>Risk Rating Low</p> <p>Compliance Rating 1</p>	<p>SM does not publish transmission constraint information in PASA</p> <p>3.16.9(f) and 3.17.9(f) require SM to publish forecast transmission capacity between potentially constrained regions under normal conditions (and for MT PASA, some contingencies). The PASA reports have placeholder fields for this information, but they are not populated, and have never been. In some situations, it would be reasonable to expect this information to be provided, such as when transmission to the Goldfields or North Country is constrained or those regions will potentially be islanded. Given that these fields have</p>	<p>Medium term: Following transfer of Western Power software tools to AEMO, review usefulness of PASA information to participants, refine reports to provide better match with what participants need, investigate automatic publication.</p>

Ref	Issue type & obligation	Risk & Compliance Ratings	Finding	Recommendation
			never been populated, it is difficult to say that there has been any great impact.	
17WEM2.42	<p>Issue Type RBP reported compliance risk (Recurring issue)</p> <p>Obligation Ch 3</p>	<p>Risk Rating Medium</p> <p>Compliance Rating 2</p>	<p>Market operations data preparation processes are heavily manual.</p> <p>Last year's finding: Much of System Management's data preparation processes are manual, though generally well-documented in the SM daily and weekly operations internal procedures. Given the manual nature of the processes, it is inevitable that from time to time errors and oversights will occur. We noted several instances where System Management data preparation activities could be improved. Specifically:</p> <ul style="list-style-type: none"> - When adjusting outage amounts for RCOQ, the analyst must manually change the values for intermittent generators, because RCOQ is 0 for these facilities. - Updates to temperature derating data are manually calculated and entered into the database. There is no history kept on this table, so identifying unintended changes is difficult - Network Operator Interface queries are based on Calendar Days, not Trading days - Calendar reminders and notifications for activity deadlines are not centralised. Individual analysts must create and maintain their own reminders, resulting in omissions, duplications and inconsistencies. - Non-compliance notifications are manually edited in the database, and not consistent in their format, making it difficult to automate the process of filtering erroneous non-compliance notifications. 	<ol style="list-style-type: none"> 1. Assess opportunities for automating to reduce manual effort and reduce errors. In particular, automate: <ul style="list-style-type: none"> • preparation of the ancillary service monthly quantities • calculation of outage quantities for intermittent generators 2. Standardise manual entry format for non-compliance notifications to simplify subsequent processes 3. Lock key spreadsheet tools and add to source control 4. Implement timestamping on manually amended database tables

Ref	Issue type & obligation	Risk & Compliance Ratings	Finding	Recommendation
			Now, some effort has been put into reducing manual processes. However, there are still many manual steps that could be removed with little effort (e.g. multiple copy and paste operations for same information for monthly AS data). AEMO have stated that focus is on the SM systems transition and will revisit this issue after that.	
17WEM2.51	<p>Issue Type RBP reported non-compliance (Recurring issue)</p> <p>Obligation 2.34.14(b); 3.21.6(a)</p>	<p>Risk Rating Low</p> <p>Compliance Rating 2</p>	<p>Lack of clarity over correct temperature for maximum facility capacity under Appendix 1(b)iii</p> <p>SM uses the maximum facility capacity provided for each facility under Appendix 1(b)iii in outage calculations and assumes that it is a 15-degree value. For some facilities, this capacity matches the 15-degree figure in the temperature derate curve supplied under Appendix 1(b)iv, but for 23 facilities it does not. It is not clear that participants understand the relationship between the 1(b)iii capacity and the 1(b)iv data, and how it is used, and the use of the 1(b)iii figure as a 15-degree figure is not explicitly noted in the rules or PSOP.</p> <p>A pending rule change RC_2014_03 Administrative Improvements to the Outage Process is intended to address this. The rule change is due for completion at the end of December 2018.</p>	<ol style="list-style-type: none"> Once rule change is complete, work with the Market Operations team to investigate whether the value under Appendix 1(b)iii (the sent-out capacity of the generator, expressed in MW) should all be 15 degrees and update the WEM Registration Technical Guide. Then ensure all capacity data is compliant.
18WEM1.22	<p>Issue Type AEMO reported non-compliance</p> <p>Obligation 3.22.1</p>	<p>Risk Rating Low</p> <p>Compliance Rating 1</p>	<p>Incorrect Margin Peak value used in April 2018 initial settlement</p> <p>MR 3.22.1(c) requires AEMO to provide the settlement system with the relevant value of Margin_Peak.</p> <p>This value is manually entered into AEMO's settlement systems.</p> <p>For the April 2018 initial non-STEM settlement run in June 2018, AEMO used an incorrect value due to human error, which was not detected by the second analyst check.</p>	Consider amending process so that parameters that change annually are entered for all months at the same time once a year, rather than each month as is current practice.

5 WEM RULES CHAPTER 4 – RESERVE CAPACITY RULES

Chapter 4 of the WEM 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 RULE AMENDMENTS

Amendments to Chapter 4 of the WEM Rules include:

- Changes to Reserve Capacity timelines and information publication requirements.
- Transitional changes to reflect the wind-up of the IMO.
- Minor cosmetic changes to clarify rule intent
- Changes to treatment of DSPs in the capacity mechanism.
- Changes to capacity refund and rebate calculations
- Changes to reserve capacity performance monitoring obligations
- New administered pricing calculations for the BRCP and DSMRCP

5.2 AEMO PROCEDURES

AEMO's Internal Procedures are compliant with Chapter 4 of the WEM Rules in all material respects.

5.3 OPERATIONAL COMPLIANCE WITH CHAPTER 4

5.3.1 Audit activities

We have:

- Reviewed self-reported instances of non-compliance with Chapter 4 of the WEM Rules.
- Conducted sample testing of certification process outputs (for the 2016 and 2017 Reserve Capacity Cycles) to determine compliance with clause 4.11.1 of the WEM Rules.

- Conducted (retrospective) business process walkthroughs to determine whether AEMO has complied with the WEM Rules and its Internal Procedures and whether AEMO has applied appropriate controls in the following areas:
 - Certification activities for the 2016 and 2017 Reserve Capacity Cycles
 - Preparation and publication of the Electricity Statement of Opportunities Report.
 - Capacity credit assignment
 - Reserve capacity monitoring

5.3.2 Audit findings

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

Table 13: Operational compliance findings associated with Chapter 4 of the WEM Rules

Ref	Issue Type & Obligation	Risk & Compliance Ratings	Finding	Recommendation
18WEM1.04	<p>Issue Type RBP reported non-compliance</p> <p>Obligation 4.5.14B</p>	<p>Risk Rating Low</p> <p>Compliance Rating 1</p>	<p>Not publishing assessment of whether to conduct a Value of Customer Response study specific to WA</p> <p>MR 4.5.14B requires AEMO to document the procedure for calculating the DSM Activation Price, and to follow that Market Procedure.</p> <p>AEMO published the Market Procedure: Determination of Expected DSM Dispatch Quantity and DSM Activation Price in June 2017.</p> <p>Clause 3.2.2 of the procedure says that AEMO will undertake an annual assessment to determine the need to conduct a VCR [Value of Customer Response] Study [in support of the calculation of the DSM Activation Price] and will publish the outcome of this assessment in the Request for Expressions of Interest.</p> <p>AEMO decided not to conduct a VCR Study due to the perceived cost. AEMO continues to use the default DSM Activation Price, set based on data from a study in the NEM. The Request for Expressions of Interest published in January 2018 did not mention this assessment.</p> <p>AEMO has now updated the EOI procedure to include this step.</p>	No further action.

Ref	Issue Type & Obligation	Risk & Compliance Ratings	Finding	Recommendation
18WEM1.05	<p>Issue Type RBP reported compliance risk</p> <p>Obligation 4.11.1</p>	<p>Risk Rating Medium</p> <p>Compliance Rating 2</p>	<p>Improvements to Capacity Certification process</p> <p>As part of our review of AEMO's capacity certification process, we reviewed a sample of CRC assessment records for the two capacity cycles carries out in the audit period:</p> <ul style="list-style-type: none"> We noted one case in which different team members applied slightly different interpretations MR 4.11.1(j). The different interpretation did not affect the amount of CRC awarded, but had the facility capability been slightly different, it could have had a non-trivial financial impact. Assessment records are not clear where CRC changes from year to year, where a facility may have passed summer tests with a lower output than currently being certified for. There is no risk of financial market impact, but did result in additional internal time to resolve. <p>We also note that the assessment of potential network constraints is focused on historic incidence of generator output constraint, rather than making a forward-looking assessment. This approach has sufficed until now but will need to be reconsidered as the market moves to a constrained access model.</p> <p>With the deployment of the new RCM software, AEMO has retired its assessment templates, and introduced electronic workflows and other checks which reduce the likelihood of error.</p> <p>AEMO has also updated its internal procedure documentation to cover these specific scenarios.</p>	No further action
18WEM1.17	<p>Issue Type AEMO reported non-compliance</p> <p>Obligation</p>	<p>Risk Rating Low</p> <p>Compliance</p>	<p>Use of incorrect input data in NTDL assessment</p> <p>MR 4.28.10 requires AEMO to only accept NTDL applications where the load satisfies the requirements of Appendix 5A.</p>	No further action

Ref	Issue Type & Obligation	Risk & Compliance Ratings	Finding	Recommendation
	4.28.9	Rating 1	<p>Step 1 bullet 1 of Appendix 5A allows AEMO to consider NTDL status where the relevant interval meter is included on a list provided by the Market Customer with which it is associated.</p> <p>Step 1 of Appendix 5A requires AEMO to take account of maintenance evidence provided by a participant when assessing an application to classify a load as NTDL.</p> <p>On two occasions, AEMO calculated NTDL status in a way that was not compliant with Appendix 5A.</p> <ul style="list-style-type: none"> - In October 2017, AEMO accepted an NTDL application for an interval meter from a Market Customer who was not the Market Customer associated with the relevant interval meter. The Market Customer in question was authorised to submit the application on behalf of another customer, but submitted using the wrong account. In practice, there was no impact, as the outcome was the same as if the participant had resubmitted using the correct account. - In December 2018, AEMO reviewed maintenance intervals provided by a participant for use in NTDL assessment, asked requested more information on some intervals from the market participant. Due to the timing of the review, AEMO accepted the intervals for the (automatically executed) January NTDL assessment. In January 2018, AEMO decided to remove some of the maintenance intervals for the February assessment, but the effort required did not allow this to happen in time for the February NTDL calculation. The intervals were updated in time for the March NTDL calculation. In practice, there was no impact, as the NTDL status would have been the same with the updated set of maintenance intervals. <p>AEMO has changed the timing of its NTDL review process to allow more time to resolve issues before calculations trigger, has documented the process required</p>	

Ref	Issue Type & Obligation	Risk & Compliance Ratings	Finding	Recommendation
			to amend previously accepted maintenance intervals, and has added validation to the market participant interface to validate that the NMI applied for is associated with the market participant submitting the application.	
18WEM1.21	Issue Type AEMO reported non-compliance Obligation 4.26.6	Risk Rating Low Compliance Rating 1	Incorrect calculation of Facility Capacity Rebate for October 2017 (RCM-related) MR 4.26.6(e) requires AEMO to calculate Facility Capacity Rebates using Sent Out Metered Schedule data. The October 2017 settlement run, which was the first on the new RCM settlement system, incorrectly used zero SOMSQ for most of the month due to a software bug. The issue was raised in a disagreement by participant, so is eligible for correction by the adjustment process, and was corrected in the first settlement adjustment. The bug did not affect other months, and a fix was released in March 2018.	No further action
18WEM1.29	Issue Type AEMO reported non-compliance Obligation 4.26.1A(b), 4.26.2	Risk Rating Low Compliance Rating 1	Incorrect calculation of Facility Refunds for October and November 2017 (RCM-related) MR 4.26.1A requires AEMO to calculate Facility Refunds accounting for voluntary reductions in capacity credits. Due to an error in the new RCM system, October 2017 settlement results did not account for voluntary capacity credit reductions. MR 4.26.2(d)(iv) requires AEMO to use Ancillary Service quantities in calculating the Net STEM Shortfall. Due to an issue introduced to the POMAX settlements software as part of the deployment of the new RCM system, AEMO omitted ancillary service quantities for two participants from this calculation.	No further action

Ref	Issue Type & Obligation	Risk & Compliance Ratings	Finding	Recommendation
			AEMO has released fixes to the system, and payments were corrected in subsequent settlement adjustments.	
18WEM1.30	<p>Issue Type AEMO reported non-compliance</p> <p>Obligation 4.12.3</p>	<p>Risk Rating Low</p> <p>Compliance Rating 1</p>	<p>Incorrect calculation of Reserve Capacity Obligation Quantities (RCM-related)</p> <p>MR 4.12.3 requires AEMO to calculate RCOQs using certain information. AEMO implemented new RCM systems to calculate RCOQs for October 2017 and following, including new data transfers from existing systems. The initial release of the data transfers inadvertently excluded data for the final 8 hours of the trading month, resulting in incorrect RCOQ for the months of October, November and December 2017 and January 2018.</p> <p>On identifying the issue, AEMO released a fix, and the errors will be resolved in subsequent settlement adjustments.</p> <p>In April 2018, AEMO upgraded its databases to Oracle 12, and certain SQL began to perform differently. As a result, from 22 April 2018 to 8 June 2018, AEMO calculated zero RCOQ values for certain facilities.</p> <p>AEMO released a patch to fix subsequent RCOQ amounts on 7 June but is still investigating options to correct the zero values.</p>	Continue to investigate options to correct the RCOQ values

6 WEM RULES CHAPTER 5 – NETWORK CONTROL SERVICES

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

There are currently no contracts for network control services. Therefore, AEMO has no active obligations under Chapter 5 of the WEM Rules.

Our audit therefore excludes any review of AEMO's compliance with Chapter 5 of the WEM Rules.

We note that the new Generator Interim Access regime will use NCS contracts as a mechanism to implement constrained network access, so we expect some NCS contracts to be in place soon.

7 WEM RULES CHAPTER 6 – THE ENERGY MARKET

Chapter 6 of the WEM 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 RULE AMENDMENTS

Amendments to Chapter 6 of the WEM Rules include:

- Submission of Consumption and Extra Consumption Decrease Prices
- Changes to the construction of non-balancing dispatch merit orders and DSP dispatch compensation

7.2 AEMO PROCEDURES

AEMO's Internal Procedures are compliant with Chapter 6 of the WEM Rules in all material respects.

7.3 OPERATIONAL COMPLIANCE WITH CHAPTER 6

7.3.1 Audit activities

Changes in chapter 6 relate to activities automated in AEMO's market software, which is covered by in-year testing and certification activities.

We have not conducted any audit procedures to assess AEMO's compliance with Chapter 6 of the WEM Rules.

7.3.2 Audit findings

Instances of non-compliance and areas of compliance risk associated with Chapter 6 are summarised in the table below.

Table 14: Operational compliance findings associated with Chapter 6 of the WEM Rules

Ref	Issue Type & Obligation	Risk & Compliance Ratings	Finding	Recommendation
18WEM1.20	<p>Issue Type AEMO reported non-compliance</p> <p>Obligation 6.15.3(b), 6.21.2(b), 9.19.1</p>	<p>Risk Rating Low</p> <p>Compliance Rating 1</p>	<p>Incorrect calculation of constrained on and off amounts for October 2017</p> <p>MR 6.15.3(b) requires AEMO to update Maximum TES and Minimum TES as soon as practicable once outage data is available.</p> <p>MR 6.16A.1 and .2 set out the calculation of Upwards and Downwards Out of Merit Generation, which use TES as an input.</p> <p>MR 6.17.3 through 6.17.5C sets out the calculation of constrained on and off quantities and prices, which use the OOMG as an input</p> <p>MR 6.21.2(b) requires AEMO to provide constrained on and off quantities and prices to the settlement system for each Trading Day.</p> <p>Provisional TES figures are calculated shortly after facility output SCADA data becomes available. They are updated to become Final TES figures once the final outage schedule is available, around three weeks later. In December 2017, AEMO used provisional TES figures in Settlement, even though Final TES values had been calculated. This happened because a manually triggered settlement pre-processing task was executed too early. As a result, some participants were paid constrained off amounts they were not entitled to, and these payments were contributed to by other participants.</p> <p>The correct Final TES figures were used in the next settlement adjustment, which corrected the error. While we agree that this action was in line with the market</p>	<p>Consider a rule change proposal to extend the list of data changes that can trigger a settlement adjustment.</p>

Ref	Issue Type & Obligation	Risk & Compliance Ratings	Finding	Recommendation
			<p>objectives, this data is not on the list of items that can trigger a settlement adjustment, so the correction (without a related notice of disagreement) is a subsequent non-compliance.</p> <p>AEMO has updated its settlement process to include a check that all Final TES values are present before executing the next settlement task.</p>	

8 WEM RULES CHAPTER 7 – DISPATCH

Chapter 7 of the WEM 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 RULE AMENDMENTS

Amendments to Chapter 7 of the WEM include:

- Changes to non-balancing facility dispatch
- New DSP data provision requirements
- Minor cosmetic changes to clarify rule intent

8.2 AEMO PROCEDURES

AEMO's Internal Procedures are compliant with Chapter 7 of the WEM Rules in all material respects.

8.3 OPERATIONAL COMPLIANCE WITH CHAPTER 7

8.3.1 Audit activities

We have conducted business process observation and walkthroughs to determine whether AEMO has complied with the WEM Rules and its Internal Procedures and whether AEMO has applied appropriate controls in the following areas:

- Preparation and provision of information to Synergy, including the Synergy Dispatch Plan.
- Dispatch (control room operations).

We have conducted compliance testing on:

- Content of Synergy Dispatch Plans.
- Content and timing of Dispatch Advisories.
- Spinning reserve and LFAS provision, to compare availability with requirement.
- Use of unpublished load forecasts

8.3.2 Audit findings

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

Table 15: Operational compliance findings associated with Chapter 7 of the WEM Rules

Ref	Issue Type & Obligation	Risk & Compliance Ratings	Finding	Recommendation
17WEM1.01	<p>Issue Type RBP reported compliance risk (Recurring issue)</p> <p>Obligation Ch 7</p>	<p>Risk Rating Significant</p> <p>Compliance Rating 2</p>	<p>Currency of and support for critical control room tools needs more focus.</p> <p>During our 2017 control room visits, we noted several issues with the SOCC UI tool, potentially resulting in insufficient reserves, poorly chosen 'similar day' forecasts and excessive manual calculations. In response, the AEMO has established a SOCC-UI Working group which manages priority of enhancements which are implemented by the WP AEMO Support team.</p> <p>The AEMO also developing new SOCCUI functional and technical documentation, which is a task still in progress.</p> <p>IT support levels are specified in a service level agreement with Western Power, which has been agreed on a 'steady state' basis. AEMO has an approved plan to bring the control room software tools in-house, however this this will be a lengthy</p>	<ol style="list-style-type: none"> 1. Complete SOCCUI documentation. 2. Ensure these issues are addressed as part of transition of control room software tools from WP to AEMO, including: <ul style="list-style-type: none"> • capturing information about the existing tools • data migration • communication paths • parallel running

Ref	Issue Type & Obligation	Risk & Compliance Ratings	Finding	Recommendation
			process, so substantial risks will remain for some time if not addressed before then.	
17WEM2.08	<p>Issue Type AEMO reported non-compliance (Recurring issue)</p> <p>Obligation 7.6.1C,D</p>	<p>Risk Rating Significant</p> <p>Compliance Rating 1</p>	<p>Not using latest BMO due to IT systems issues</p> <p>Clauses 7.6.1C and 7.6.1D set out the Dispatch Criteria and the rules around out of merit dispatch. In previous years, IT systems issues resulted in System Management being unable to load the latest BMOs to its systems on multiple occasions. During these times, System Management continued to dispatch in accordance with the most recently loaded BMO. The impact of the breach depends on the timing of the outage. When occurring in the early hours of the morning (when generation and load is flat) the system impact would be minor, but at other times (and particularly where the outage extended over several hours) out of merit dispatch is more likely to result. In any case, dispatching from something other than the latest BMO is a breach of Clauses 7.6.1C and 7.6.1D of the Electricity Rules and subsequent out of merit dispatch will result in a constraint payment to a participant who would have otherwise not received one.</p> <p>This issue is still ongoing, with 6 self-reported instances during this audit period. Many of the instances were caused by file transfer issues, for which</p>	Continue to investigate, determine root causes, and apply fixes for each failure.

Ref	Issue Type & Obligation	Risk & Compliance Ratings	Finding	Recommendation
			a fix was identified and put in place in September 2017. However, further instances have occurred, due to other upstream issues. AEMO are working with Western Power to resolve.	
17WEM2.11	<p>Issue Type RBP reported compliance risk (Recurring issue)</p> <p>Obligation Ch 7</p>	<p>Risk Rating Medium</p> <p>Compliance Rating 3</p>	<p>There is room to better align the dispatch process with market objectives around economic efficiency</p> <p>System Management controllers use 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, particularly if the dispatch period was shortened from the current half hour.</p>	<p>No current action.</p> <p>In the long term, market dispatch timing will be addressed as part of market reform.</p>
17WEM2.13	<p>Issue Type RBP reported compliance risk (Recurring issue)</p> <p>Obligation 7.6.2; 7.13.1</p>	<p>Risk Rating Medium</p> <p>Compliance Rating 2</p>	<p>System Management’s dispatch decisions around Synergy plant are opaque</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 prepare a record of Dispatch Orders issued for each trading interval in the trading day.</p>	<ol style="list-style-type: none"> 1. Ensure that electronic logbook guidelines are followed consistently 2. Update the guidelines to Ensure reasoning for dispatch decisions is captured: Define ‘normal’ and a defined set of ‘abnormal’ dispatch decisions.

Ref	Issue Type & Obligation	Risk & Compliance Ratings	Finding	Recommendation
			<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 is not, 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 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 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, this this is not always the case, as the high and low bounds of the Dispatch Plan are based on forecasts that will not always reflect real-time conditions up to 24 hours in the future.</p>	<p>Update guidelines such that each dispatch decision is identified with the type of decision being followed.</p>

Ref	Issue Type & Obligation	Risk & Compliance Ratings	Finding	Recommendation
			<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. Now, an electronic logbook has been implemented, and control room logging guidelines have been developed to improve the consistency of logging portfolio plant movements. However:</p> <ul style="list-style-type: none"> - The guidelines are not being consistently followed (see 18WEM1.10) - The guidelines do not specify recording the reasons for any portfolio plant dispatch targets. Therefore, even if the guidelines are followed, the decisions behind the dispatch targets remain opaque. 	
17WEM2.14	<p>Issue Type RBP reported compliance risk (Recurring issue)</p> <p>Obligation Ch 7</p>	<p>Risk Rating Low</p> <p>Compliance Rating 2</p>	<p>There is opportunity to improve the audit trail of control room operations</p> <p>In previous years, the level of records for control room activities was not sufficient to reconstruct events after the fact. The written log provided 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 one or two entries. While there are database records of some actions taken such as constraints applied, these are not sufficient.</p>	<p>Ensure that electronic logbook guidelines are followed consistently</p>

Ref	Issue Type & Obligation	Risk & Compliance Ratings	Finding	Recommendation
			<p>Now, an electronic logbook system has been implemented, and control room logging guidelines have been developed to improve the consistency of control room logging. However, the guidelines are not being consistently followed (see 18WEM1.10). As a result, there is still room to improve the audit trail of control room operations.</p>	
17WEM2.18	<p>Issue Type RBP reported compliance risk (Recurring issue)</p> <p>Obligation 7.13.1(cA)</p>	<p>Risk Rating Low</p> <p>Compliance Rating 3</p>	<p>SCADA data cleansing processes remove consumption data.</p> <p>Previous year's finding: When preparing facility SCADA data for use in settlement, SM manually cleans the data to remove spurious readings. Any negative values are adjusted to equal zero by the Pi back end software. This practice is not described in the Cleansing of Generation Facility MWh output data PSOP.</p> <p>However, some facilities do legitimately draw power, for example when starting a thermal unit. In these cases, the unit will not be charged for its usage, and the additional usage will be washed up and settled as part of the notional meter.</p> <p>Because only Synergy facilities are settled on SCADA data, the overall effect should be minimal, as the amounts involved still form part of Synergy's bill.</p> <p>The ultimate solution to this issue would be to require facilities currently settled on SCADA data have revenue</p>	<p>Update Cleansing of Generation Facility MWh output data guidelines to reflect all data cleansing steps.</p>

Ref	Issue Type & Obligation	Risk & Compliance Ratings	Finding	Recommendation
			<p>meters installed, but this is not likely to occur unless and until the market moves to a facility bidding model.</p> <p>This year AEMO have advised that the PSOP has no head of power under the market rules, so is being replaced by a guideline. Revision of the guideline to address this issue has not yet occurred, so we are retaining this finding.</p>	
17WEM2.20	<p>Issue Type RBP reported non-compliance (Recurring issue)</p> <p>Obligation 7.6A.2I</p>	<p>Risk Rating Low</p> <p>Compliance Rating 1</p>	<p>Dispatch Plan and associated Information provided to Synergy does not include specified ancillary service information, and the format and time resolution is not described in a procedure.</p> <p>Last year's finding:</p> <p>Clause 7.6A.2 requires AEMO to provide to Synergy by 4pm:</p> <ul style="list-style-type: none"> 2. forecast energy required from the balancing portfolio ii. The Dispatch Plan for each portfolio facility iii. A forecast of the detailed Ancillary Services required from each Facility in the portfolio. <p>Where the format and time resolution of this data is to be described in a procedure.</p> <p>We have not observed any procedure (either internal or Market Procedure) which describes the format and time resolution. We note that slight variations on</p>	<ul style="list-style-type: none"> 1. Standardize Dispatch Plan creation process and describe in a procedure. 2. Alter dispatch plan preparation process to remove reliance on sheet containing confidential information

Ref	Issue Type & Obligation	Risk & Compliance Ratings	Finding	Recommendation
			<p>format are used, some including aggregated resource plan quantities and LFAS enablement for non-portfolio facilities, and some not. The information is prepared by copying information from the SOCC UI tool, which does include confidential information on non-portfolio facilities. We did not find any confidential information in the dispatch plans we reviewed, but it has been sent in the past, and the risk remains.</p> <p>Finally, the information provided to Synergy provides only aggregated ancillary services requirements – not broken out by facility as required by the rules. Adding this level of detail is unlikely to be of much value until facility bidding is introduced.</p> <p>Now, a dispatch plan guideline has been created, but it still does not specify format and time resolution, so retaining this finding.</p>	
17WEM2.21	<p>Issue Type RBP reported compliance risk (Recurring issue)</p> <p>Obligation Ch 7</p>	<p>Risk Rating Low</p> <p>Compliance Rating 2</p>	<p>Verbal dispatch instructions are not automatically recorded in IT systems</p> <p>Last year’s finding: In our review of control room logs, we identified one instance where a facility was verbally dispatched by the controller in advance of the automatic RTDE recalculation. This meant that a matching electronic record had to be added manually after the fact. The market operations analyst on duty did not notice the occurrence, meaning that the</p>	<p>Ensure that electronic logbook guidelines are followed consistently.</p>

Ref	Issue Type & Obligation	Risk & Compliance Ratings	Finding	Recommendation
			<p>record of dispatch would have been lost, and that participant non-compliance data would be incorrect.</p> <p>The long-term solution would be to make all dispatch electronic, but we accept that this may not be pragmatic until facility bidding is introduced.</p> <p>Now, an electronic logbook system has been implemented, control room logging guidelines have been developed to improve the consistency of control room logging. However, the guidelines are not being consistently followed (see 18WEM1.10)“</p>	
17WEM2.22	<p>Issue Type RBP reported compliance risk (Recurring issue)</p> <p>Obligation Ch 7</p>	<p>Risk Rating Medium</p> <p>Compliance Rating 2</p>	<p>Control room business continuity plans do not include continuous oversight of power system, and IT system disaster recovery plans are not sufficient</p> <p>Last year we found that control room business plan continuity plans left the system uncontrolled while control room staff relocate and set up at the secondary site. If a serious power system event were to go occur in this period, there would have been a high chance of losing load, damaging equipment, and otherwise breaching the market rules.</p> <p>This year, a BCP plan has been created, which includes handing over frequency control to WP while AEMO controllers relocate to backup site. Mobile phone</p>	<ol style="list-style-type: none"> 1. Implement plan to allow remote access to control room tools once they come in-house. 2. Schedule and carry out regular BCP plans.

Ref	Issue Type & Obligation	Risk & Compliance Ratings	Finding	Recommendation
			<p>contact while in transit. This new BCP has been tested rigorously.</p> <p>In the longer term: When SM IT systems come in-house, AEMO will be able to have remote access to 'Green Zone' applications. This will allow system control via laptop connected to Wi-Fi e.g. at hotel across road.</p> <p>We are retaining this finding to monitor progress on the long-term plan, and to ensure that the BCP is tested regularly.</p>	
18WEM1.03	<p>Issue Type RBP reported non-compliance</p> <p>Obligation 7.6.10A</p>	<p>Risk Rating Low</p> <p>Compliance Rating 1</p>	<p>PSOP: Dispatch does not include required information for DSP real-time consumption data</p> <p>MR 7.6.10A requires SM to develop a PSOP setting out the manner and timing for participants to provide real-time DSP consumption data, including how consumption is to be measured or estimated. MR 10.5.1(zJ) then requires AEMO to publish this data on the market website, similar to the provisions for scheduled generators.</p> <p>In our view the intention of the rules is for DSM to provide real time data just like generators, and that AEMO should specify the manner and timing for them to do so.</p> <p>AEMO updated the PSOP: Dispatch in October 2017 to include section 4.8 Demand Side Programmes, which begins "AEMO may request a Market Participant to</p>	<p>Update the PSOP to give more information on the methodology for getting real-time consumption data from DSPs.</p>

Ref	Issue Type & Obligation	Risk & Compliance Ratings	Finding	Recommendation
			<p>provide the current consumption in a manner agreed between the parties when it is anticipated that the dispatch of a Non-Balancing Facility may be required”</p> <p>The PSOP does not specify a particular manner or time and does not include how consumption is to be measured or estimated as required by the Rule. AEMO did identify some more specific mechanisms by which participants would provide this data, but did not include the options in the PSOP.</p>	
18WEM1.07	<p>Issue Type RBP reported non-compliance</p> <p>Obligation 7.11.3</p>	<p>Risk Rating Low</p> <p>Compliance Rating 1</p>	<p>Late issuance of Dispatch Advisories</p> <p>MR 7.11.3 requires SM to send DAs out as soon as practicable after System Management becomes aware of the relevant event.</p> <p>Historically, Dispatch Advisories were issued by market analysts after they had been informed by control room staff. In December 2017, AEMO shifted responsibility for issuing DAs to control room staff as part of establishing the security desk. Since then, the time between event and DA issuance has decreased, and only one has been issued more than 60 minutes after the event.</p> <p>In the sample we tested, we noted 3 instances in which System Management sent out Dispatch advisories more than 60 minutes after the event occurred. These are DAs 17204, 17218 and 17801. The longest delay was four hours. Two of these DAs related to High Risk</p>	No further action.

Ref	Issue Type & Obligation	Risk & Compliance Ratings	Finding	Recommendation
			Operating State events. As such, it is important for System Management to release such advisories promptly.	
18WEM1.08	<p>Issue Type RBP reported non-compliance</p> <p>Obligation 7.6.1(c), 3.12.1</p>	<p>Risk Rating Medium</p> <p>Compliance Rating 1</p>	<p>Under provisioning of ancillary services</p> <p>MR 7.6.1(c) requires AEMO, when dispatching facilities, to maintain Ancillary Services to meet Ancillary Service standards.</p> <p>MR 3.12.1 requires AEMO to schedule and dispatch facilities to meet the Ancillary Service Requirements in each trading interval.</p> <p>MR 3.10.1 defines the standard for LFAS as the greater of 30MW and the capacity sufficient to meet 99.9% of the short-term fluctuation in load, Non Scheduled Generator output, and uninstructed output fluctuation from Scheduled Generators, measured as the variance of 1-minute average readings around a 30 min rolling average.</p> <p>MR 3.10.2 defines the standard for spinning reserve as ('standard level') the greater of 70% of total output of the unit with the largest current injection, and the maximum load ramp expected over a period of 15 minutes. The level of spinning reserve available includes the capacity utilised to meet the load following standard, and the level can be relaxed by up to 12% ('relaxed level') where the shortfall is expected to last less than 30 minutes.</p>	<ol style="list-style-type: none"> 1. Analyse characteristics of situations with a Spinning Reserve shortfall to understand risk levels 2. Assess LFAS Requirement according to 3.10.1 standard, in addition to forecast error method. 3. Consider how to get view of AS performance and risk on a more frequent basis than annually.

Ref	Issue Type & Obligation	Risk & Compliance Ratings	Finding	Recommendation
			<p>MR3.10.4 defines the standard for Load Rejection Reserve as the level sufficient to keep over-frequency below 51Hz for all credible load rejection events, which may be relaxed by up to 25% where transmission faults are unlikely.</p> <p>MR 3.10.5 allows AEMO to reduce the level of LFAS, Spinning Reserve or LFAS following a contingency or to avoid load shedding.</p> <p><i>Spinning Reserve</i></p> <p>We reviewed AEMO dispatch of SR for two days (2 Jan and 14 May). We considered only the generation requirement, and not the ramp requirement. We found two intervals (8-1 and 10-2 on 2 Jan) where SR levels were below the standard level, but none below the relaxed level. Both instances were for only a single half-hour.</p> <p>AEMO carried out a similar analysis in preparing its annual Ancillary Services report. That analysis showed that 1.9% of the time, Spinning Reserve levels were outside the relaxed requirement or outside the standard requirement for more than 30 consecutive minutes. The Rules are not entirely clear on whether SR is to include only the unused portion of enabled LFAS, or the full LFAS activation (effectively reducing the SR requirement by 72MW at all times). AEMO's view is that it should be only the unused portion, and</p>	

Ref	Issue Type & Obligation	Risk & Compliance Ratings	Finding	Recommendation
			<p>this is what is measured and displayed on control room tools and described in A1.3 of AEMO's Ancillary Services Report. We agree with this interpretation.</p> <p><i>LFAS</i></p> <p>We reviewed AEMO use of LFAS for two days (2 Jan and 14 May). The LFAS analysis is more complex than the SR analysis. The LFAS Standard is a long-term standard and informs the LFAS Requirement (set annually) and the LFAS Quantity (notionally set daily and updated under 7B.1.4 and .5, but in practice is never varied from the annual Requirement).</p> <p>AEMO sets the LFAS Requirement (and the LFAS Quantity) at 72MW each of LFAS up and down. At most times, more is available, because it is simply the unused capacity of units on AGC). At any given time, some of the enabled capacity will be actually in use - following the load as intended - meaning that the measured available LFAS in one direction will be less than 72MW. If LFAS down is enabled, we would expect to see more than 72MW of LFAS up available, and vice versa. We found three intervals (15-1, 16-2 and 17-2 on 2 Jan) where the total available quantity of LFAS up plus LFAS down was less than 144MW. This appears to be non-compliant with MR 3.12.1.</p> <p>We also looked at the 3.10.1 LFAS Standard calculation. Total system load and NSG output are relatively</p>	

Ref	Issue Type & Obligation	Risk & Compliance Ratings	Finding	Recommendation
			<p>straightforward. We used one-minute dispatch non-compliance notifications (issued under 7.10.5(c)) as a proxy for uninstructed Scheduled Generator output fluctuations. Because these are only logged where the fluctuation is outside the dispatch tolerance, so our sample does not include any periods where the fluctuation remained inside the tolerance.</p> <p>Applying the LFAS Standard to those two days (i.e. covering 99.9% of the variation within the day) would have resulted in required LFAS Up levels of 76.6MW and 91.5MW and required LF down levels of 65.1MW and 80.5MW. This analysis is not conclusive but is in the ballpark of the 72MW figure used by AEMO.</p> <p>In preparing its annual Ancillary Services report, AEMO carried out two analyses:</p> <ul style="list-style-type: none"> • One calculating whether the LFAS standard had been met in the previous year (similar to our analysis above), which concluded that the LFAS standard was not met 0.43% (Up) and 0.41% (Down) of the time. • One calculating the LFAS Requirement for the following year, which used forecast error (for load and NSG output) as the primary driver. This analysis concluded that the 99th percentile of 10 minute ahead forecast error was 78MW, though the 99.9th percentile was 112MW. This analysis did not include uninstructed scheduled generator fluctuation. 	

Ref	Issue Type & Obligation	Risk & Compliance Ratings	Finding	Recommendation
			<p>Based on this analysis and the characteristics of available plant, AEMO retained the LFAS Requirement at 72MW in each direction, and this figure was approved by ERA. We expect that this will again result in non-compliance next year.</p> <p><i>Load Rejection Reserve</i></p> <p>We did not analyse Load Rejection Reserve. AEMO analysis for the annual Ancillary Services Report found that the LRR standard was not met 6.5% of the time. This was in part due to conscious decisions on the part of control room personnel to provision less LRR than strictly required.</p> <p>AEMO has since corrected its LRR provisioning process to ensure that control room personnel allocate sufficient LRR.</p> <p><i>Risks</i></p> <p>The new analysis carried out by AEMO means AS performance is better understood than a year ago. Nevertheless, there is still a need for improvement. The extent of under-provisioning is not clear - while the average shortfall was 21MW, we do not know the distribution of shortfalls.</p> <p>Further, while the impact of a contingency event during a period where SR or LFAS was under-provisioned is not clear, a truly extreme outcome would require additional things to go wrong, such as</p>	

Ref	Issue Type & Obligation	Risk & Compliance Ratings	Finding	Recommendation
			<p>the failure of backup reliability measures such as Under Frequency Load Shedding. For this reason, the risk is classed as Medium rather than Significant.</p> <p>Finally, we are conscious that Ancillary Service definitions are under review by the PUO, and this may factor into the level of effort that AEMO devotes to improving transparency and compliance with the current definitions.</p>	
18WEM1.10	<p>Issue Type RBP reported compliance risk</p> <p>Obligation Ch 7</p>	<p>Risk Rating Low</p> <p>Compliance Rating 2</p>	<p>Inconsistent application of control room log guidelines.</p> <p>"Electronic control room logs are a major advance over paper-based logs, but benefits are not fully realised due to inconsistent application of logging procedures. The Internal Guideline ("Electronic Logbook - Dispatch Controller v3") is not being consistently applied. In particular:</p> <ul style="list-style-type: none"> - 'Event Type' field is rarely filled in, and on many sheets we viewed, not at all. This will make it much harder to search for events of a particular type. - Required data items, as specified in the Internal Guideline are inconsistently recorded. For example, system impact for loss of generation events not recorded in several examples - Daily weather outlook, as required by the Internal Guideline, not recorded in any of the logs we reviewed 	<p>Review log sheets from each controller on regular basis to ensure consistent application of logging guideline.</p>

Ref	Issue Type & Obligation	Risk & Compliance Ratings	Finding	Recommendation
			- Large blocks of time, each spanning several hours, in which there are no log entries. Given that portfolio plant movements are required to be logged, these indicate that either logging was not performed, or log data has been lost. For example: No log entries between 17:54 05/01/2018 and 14:00 16/01/2018"	
18WEM1.11	<p>Issue Type RBP reported compliance risk</p> <p>Obligation Ch 7</p>	<p>Risk Rating Medium</p> <p>Compliance Rating 2</p>	<p>Communications protocol with Western Power not being followed</p> <p>An AEMO-Western Power Control Room Communications Protocol has been established, to ensure clear and consistent communications and thereby avoid misunderstandings that could lead to adverse system events. We observed an instance of communication with WP that did not follow the protocol and used the vague terms that the protocol seeks to avoid (e.g. "I was wondering if you could..." and accepting a "no worries" response). Given that the protocol is not a natural way of communicating, practice and monitoring will be necessary to ensure consistent application.</p>	<ol style="list-style-type: none"> 1. Ensure that controllers practice communication using the protocol 2. Monitor to ensure consistent application.
18WEM1.23	<p>Issue Type AEMO reported non-compliance</p> <p>Obligation 7.13.1(eF)</p>	<p>Risk Rating Medium</p> <p>Compliance Rating 1</p>	<p>Failure to prepare dispatch volumes for non-scheduled generators receiving a dispatch instruction</p> <p>When a non-scheduled generator is issued with a dispatch instruction, Clause 7.13.1(eF) requires System Management to calculate the maximum sent out energy the facility would have generated if the</p>	<ol style="list-style-type: none"> 1. Review dispatch instruction and calculated dispatch volume data to determine the extent of the problem. 2. Develop a system or procedure to ensure that all

Ref	Issue Type & Obligation	Risk & Compliance Ratings	Finding	Recommendation
			<p>dispatch instruction had not been issued, by noon on the first business day following the day in which the trading day ends.</p> <p>A self-reported breach (dated 09/03/2018) documents a case in which this was not done until 1 day later due to an oversight by a staff member. The corrective action taken was to reinforce the education of the staff regarding the required procedures when security constraints are in place.</p> <p>Our analysis of dispatch instruction and dispatch volume data indicates there are several other occasions on which no dispatch volumes have been prepared for non-scheduled generators receiving a dispatch instruction. For example, INVESTEC_COLLGAR_WF1 on 5/9/17 13:22-21:17, and EDWFMAN_WF1 on 14/12/17 11:41-12:22. This indicates a historic practice rather than an isolated human error. This will affect the settlement quantities for these generators, so will have a financial impact.</p>	<p>instances of a non-scheduled generator receiving a dispatch instruction are processed in a manner that is not vulnerable to human oversight.</p>
18WEM1.24	<p>Issue Type AEMO reported non-compliance</p> <p>Obligation 7.6.1C(c)</p>	<p>Risk Rating Low</p> <p>Compliance Rating 1</p>	<p>Dispatch instruction issued with ramp rate in excess of standing data ramp rate</p> <p>MR 7.6.1C(c) requires SM to take into account the standing data ramp rate limit when dispatching a balancing facility out of merit. At 07:15 on 25/01/2018, system management issued a DI to a facility to ramp at 10MW/min when the facility's standing data limit</p>	<p>No further action</p>

Ref	Issue Type & Obligation	Risk & Compliance Ratings	Finding	Recommendation
			<p>was 8MW/min, due to oversight by the duty controller. The asset owner asked why a higher ramp rate had been used, but no system or facility issues were caused.</p> <p>The risk of this kind of breach is inherent in the manual nature of the current dispatch procedures. Electronic dispatch could control this risk, but we accept that this may not be pragmatic until facility bidding is introduced.</p>	
18WEM1.25	<p>Issue Type AEMO reported non-compliance</p> <p>Obligation 7.10.5(c)</p>	<p>Risk Rating Low</p> <p>Compliance Rating 1</p>	<p>Failure to issue warning beyond automated one-minute non-compliance notification</p> <p>MR 7.10.5(c) requires SM to warn a market participant when they are non-compliant with their DI and request an explanation. SM did issue an automated 1-minute non-compliance notification, but did not issue a warning beyond this, so no explanation was requested.</p> <p>This was due to controller oversight. SM Operations advised the Power System Operations of this event and the required procedures in the event of facility non-compliance.</p>	No further action
18WEM1.26	<p>Issue Type AEMO reported non-compliance</p> <p>Obligation 7.6A.2(b)</p>	<p>Risk Rating Low</p> <p>Compliance Rating 1</p>	<p>Load forecast not sent to Synergy</p> <p>MR 7.6A.2(b) requires SM to provide Synergy a total system demand forecast by 8:30 on each scheduling day. On the 15th of November 2017, the process to</p>	No separate action – refer to finding 17WEM2.08 regarding Western Power IT issues.

Ref	Issue Type & Obligation	Risk & Compliance Ratings	Finding	Recommendation
			<p>provide this failed due to multiple IT issues at Western Power.</p> <p>The underlying issue is intermittent and still exists, with a work-around currently in place.</p>	
18WEM1.28	<p>Issue Type RBP reported compliance risk</p> <p>Obligation 7.11.5(d),(g)</p>	<p>Risk Rating Medium</p> <p>Compliance Rating 2</p>	<p>Non-issuance of Dispatch Advisories in case of facility outage</p> <p>MR 7.11.5 requires SM to issue Dispatch Advisories in specific situations.</p> <p>We noted several instances where controllers entered a manual constraint on a facility (reflecting that the facility had been dispatched but was not available) but did not issue a Dispatch Advisory. In these cases, the next unit in the BMO would be dispatched instead (or the marginal unit, but the published BMO would not reflect the outage, and participants would not know about it. 5 instances (12 Aug, 24 Oct, 2 Dec, 20 Dec, 29 Mar) were for outages of between 75MW and 135MW. AEMO's Dispatch Advisory Guidelines provide guidance on what is a 'significant' generation outage, and in cases where the outage only affects output of the portfolio, controllers generally do not issue a DA.</p> <p>It is arguable whether these manual constraints result in Out of Merit Dispatch (per the Chapter 11 definition), but even if the rules do not explicitly require a DA to be issued, it would be in the best interests of the market to issue one.</p>	<ol style="list-style-type: none"> 1. Consider an appropriate threshold for generator outages above which to issue a Dispatch Advisory. 2. Amend Dispatch Advisory guidelines to include publication of all generator outages over the threshold

Ref	Issue Type & Obligation	Risk & Compliance Ratings	Finding	Recommendation
			As in past years, we note that the rules around Dispatch Advisories date from before the in-day balancing market and are not an efficient mechanism for publishing market information in a close-to-real-time market.	
18WEM1.31	<p>Issue Type</p> <p>RBP reported compliance risk</p> <p>Process</p> <p>SM - Operations, Governance and Integration</p>	<p>Risk Rating</p> <p>Medium</p> <p>Compliance Rating</p> <p>2</p>	Currency of and support for critical control room tools has been an issue in the past (see finding 17WEM1.01) and significant progress has been made in addressing these issues. As control room software tools are transitioned from WP to AEMO, care will need to be taken to ensure that these issues do not recur.	<p>Ensure these issues are addressed as part of transition of control room software tools from WP to AEMO, including:</p> <ul style="list-style-type: none"> • capturing information about the existing tools • data migration • communication paths • parallel running

9 WEM RULES CHAPTER 7A – BALANCING MARKET

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

9.1 RULE AMENDMENTS

Amendments to Chapter 7A of the WEM Rules include only minor cosmetic changes to clarify rule intent.

9.2 AEMO PROCEDURES

AEMO's Internal Procedures are compliant with Chapter 7A of the WEM Rules in all material respects.

9.3 OPERATIONAL COMPLIANCE WITH CHAPTER 7A

9.3.1 Audit activities

- We reviewed the use of manual Load Forecast overrides, and the monitoring of load forecast accuracy

9.3.2 Audit findings

Instances of non-compliance and areas of compliance risk associated with Chapter 7A of the WEM Rules are summarised in the table below.

Table 16: Operational compliance findings associated with Chapter 7A of the WEM Rules

Ref	Issue Type & Obligation	Risk & Compliance Ratings	Finding	Recommendation
17WEM2.15	<p>Issue Type RBP reported non-compliance (Recurring issue)</p> <p>Obligation 7A.3.15</p>	<p>Risk Rating Low</p> <p>Compliance Rating 1</p>	<p>RDQ forecasts prepared by AEMO do not always reflect best estimate of forecast load</p> <p>Clause 7A.3.15 requires System Management to prepare a forecast of the Relevant Dispatch Quantity (RDQ) for each future Trading Interval, which is then used in preparing the Forecast BMO. 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 published to the market every half hour. However, from time to time (2.9% of intervals during the period from 1 July 2017 to 31 March 2018), 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 the alternate load forecast to the market (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, we reviewed System Management's use of alternate forecasts and noted 8 instances in which the Metrix forecast was overridden by an alternate</p>	<p>Either:</p> <ol style="list-style-type: none"> Investigate a mechanism to capture and publish the actual load forecast used in the control room. <p>OR</p> <ol style="list-style-type: none"> Investigate improvements to published load forecast to reduce need to manually override

Ref	Issue Type & Obligation	Risk & Compliance Ratings	Finding	Recommendation
			<p>forecast for more than two hours (none were for longer than three hours). In 6 cases, the change is noted on the control room log sheet, along with a reason. In 1 case the change is noted with no reason given. In 1 case, there is no record of the change on the control room log sheet.</p> <p>The audit trail for use of alternate forecasts has significantly improved since last year (2018:6/8 sampled were fully recorded on log sheet. 2017:4/10), and the amount of time they are used has significantly reduced (from 8.1% to 2.9%). Nevertheless, this is a recurring and systemic issue around the provision of market data. In our view, the most recent and accurate forecast should be stored, as this is a crucial input into the BMO. If System Management is using alternate load forecasts for multiple consecutive intervals, then it is this alternate load forecast that should be stored and used in downstream processes to create the BMO (as this is the best estimate at the time).</p> <p>We have determined these 8 instances to be a breach of clause 7A.3.15 as the prolonged use of the alternate forecast indicates that System Management did not believe Metrix to be the best forecast of RDQ in upcoming intervals.</p> <p>As this is a recurring issue and System Management has no means to transmit alternate forecasts to the market, it is likely this breach will recur. We have not assessed the impact of these particular breaches, but where recorded, the forecast errors are between 40-80MW.</p>	
18WEM1.13	<p>Issue Type AEMO reported non-compliance</p> <p>Obligation 7A.3.19</p>	<p>Risk Rating Low</p> <p>Compliance Rating 1</p>	<p>Failure to provide forecast for spare capacity for Trading Interval</p> <p>MR 7A.3.19 requires AEMO to publish the Balancing Forecast for each Trading Interval.</p>	<p>Update the Market Procedure to capture this information</p>

Ref	Issue Type & Obligation	Risk & Compliance Ratings	Finding	Recommendation
			The WEM Rules effective on 13/10/2017 updated the definition of "Balancing Forecast" to include the spare capacity for the Trading Interval. AEMO did not publish this information until WEMS 3.25 was released in April 2018.	

10 WEM RULES CHAPTER 7B – LOAD FOLLOWING SERVICE MARKET

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

10.1 RULE AMENDMENTS

There have been no amendments to Chapter 7B of the WEM Rules.

10.2 AEMO PROCEDURES

AEMO's Internal Procedures are compliant with Chapter 7B of the WEM Rules in all material respects.

10.3 OPERATIONAL COMPLIANCE WITH CHAPTER 7B

10.3.1 Audit activities

- We compliance tested whether AEMO has provisioned LFAS in accordance with the requirements set out in Chapter 7B of the WEM Rules.

10.3.2 Audit findings

We did not observe any instances of non-compliance with Chapter 7B of the WEM Rules.

11 WEM RULES CHAPTER 8 – WHOLESALE MARKET

METERING

Chapter 8 of the WEM 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 RULE AMENDMENTS

There have been no amendments to Chapter 8 of the WEM Rules.

11.2 AEMO PROCEDURES

AEMO's Internal Procedures are compliant with Chapter 8 of the WEM Rules in all material respects.

11.3 OPERATIONAL COMPLIANCE WITH CHAPTER 8

AEMO has limited obligations under Chapter 8 of the WEM Rules.

We have conducted no audit activities pertaining to Chapter 8 of the WEM Rules.

We have noted no instances of non-compliance or compliance risk associated with AEMO's obligations under Chapter 8 of the WEM Rules.

12 WEM RULES CHAPTER 9 - SETTLEMENT

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

12.1 RULE AMENDMENTS

Amendments to Chapter 9 of the WEM Rules include

- minor cosmetic changes to clarify rule intent
- Changes to capacity credit allocation to implement changes to the capacity mechanism relating to DSPs
- Changes to reserve capacity settlement calculations
- transitional changes to reflect the wind-up of the IMO.

12.2 AEMO PROCEDURES

AEMO's Internal Procedures are compliant with Chapter 9 of the WEM Rules in all material respects.

12.3 OPERATIONAL COMPLIANCE WITH CHAPTER 9

12.3.1 Audit activities

We have:

- Reviewed instances of self-reported non-compliance incidents with AEMO staff.
- Undertaken (real-time) business process walkthroughs of NSTEM billing and invoicing activities.
- Undertaken (retrospective) business process walkthroughs of NSTEM Initial Settlement and Adjustment Settlement verification activities.

12.3.2 Audit findings

Instances of non-compliance and areas of compliance risk associated with Chapter 9 of the WEM Rules are summarised in the table below.

Table 17: Operational compliance findings associated with Chapter 9 of the WEM Rules

Ref	Issue Type & Obligation	Risk & Compliance Ratings	Finding	Recommendation
18WEM1.09	<p>Issue Type RBP reported non-compliance</p> <p>Obligation 9.9.4</p>	<p>Risk Rating Low</p> <p>Compliance Rating 1</p>	<p>Incorrect Ancillary Service contract payments</p> <p>MR 9.9.4 requires AEMO to calculate Ancillary Services Payments using 'the applicable monthly dollar value for that Trading Month under the Ancillary Services Contract'.</p> <p>In March 2018, AEMO changed the way it calculates the payment for one Ancillary Service Contract. The contract did not change, but the payment calculation was deemed to have been incorrect. The impact is of a few thousand dollars per month, and the incorrect calculations had been visible to the affected participant.</p>	<p>No further action.</p> <p>AEMO has corrected the calculation.</p>
18WEM1.14	<p>Issue Type AEMO reported non-compliance</p> <p>Obligation 9.1.3, 9.19.3(b)</p>	<p>Risk Rating Low</p> <p>Compliance Rating 1</p>	<p>Incorrect interest rate applied to non-STEM settlement adjustments</p> <p>MR 9.1.3 requires AEMO to use the Bank Bill Rate when calculating interest payments.</p> <p>MR 9.19.3(b) requires AEMO to calculate and charge interest on non-STEM adjustment amounts.</p> <p>The Bank Bill Rate for each month is manually entered into AEMO's settlement systems.</p> <p>In settlement adjustments calculated in October 2017, AEMO used an incorrect Bank Bill Rate due to human error. As a result, some participants were underpaid, and others were overpaid. Six participants were affected by more than \$100.</p>	<p>No further action.</p>

Ref	Issue Type & Obligation	Risk & Compliance Ratings	Finding	Recommendation
			<p>There is no rule mechanism to correct the issue, as incorrect interest payments are not included in the list of items that trigger a recalculation under 9.19.1(a). AEMO facilitated a voluntary process by which participants redistributed the incorrectly calculated amounts. AEMO now has a second analyst review all manual entries.</p>	
18WEM1.15	<p>Issue Type AEMO reported non-compliance Obligation 9.4.10, 9.4.12</p>	<p>Risk Rating Low Compliance Rating 1</p>	<p>Failure to notify Market Participant by Capacity Over Allocation deadline (RCM-related)</p> <p>MR 9.4.10 requires AEMO to notify a market participant which has more capacity credits allocated than its IRCR, so that they can adjust the allocation.</p> <p>MR 9.4.12 requires AEMO to revoke all allocation submissions to an overallocated participant who does not adjust allocations in response to the notification.</p> <p>AEMO has automated monitoring to alert operations staff if a participant is overallocated. Part of the changeover to new settlement systems required creating alerts monitoring the new system to replace alerts monitoring the existing system. AEMO deactivated existing alerts a few days early, so they did not trigger.</p> <p>In October 2017, AEMO failed to notify an overallocated participant, and then revoked their allocations even though the participant had not been notified. The impact is that the participants will settle this via AEMO rather than bilaterally and must execute a side payment to resolve the issue.</p> <p>The automated monitoring is now in place on the new system.</p>	No further action
18WEM1.18	<p>Issue Type AEMO reported non-compliance Obligation 9.4.13</p>	<p>Risk Rating Low Compliance Rating 1</p>	<p>Late notification to Market Participants of Capacity Credits accepted as submitted (RCM-related)</p> <p>MR 9.4.13 requires AEMO to notify participants when their capacity credit allocations are accepted.</p> <p>On 27 Sep 2017, AEMO notified participants 2h 49 minutes late, due to a missing manual date entry in legacy market systems.</p>	No further action

Ref	Issue Type & Obligation	Risk & Compliance Ratings	Finding	Recommendation
			<p>Prior to the implementation of the new RCM system, date triggers were updated monthly by IT support. In the changeover to the new system, this activity was missed for one month, and the automatic notification was not sent. The missing notification was detected by automatic monitoring.</p> <p>In the new system, the dates are updated annually by operations staff.</p>	
18WEM1.19	<p>Issue Type AEMO reported non-compliance</p> <p>Obligation 3.22.1(g), 9.9.3, 9.19.1</p>	<p>Risk Rating Low</p> <p>Compliance Rating 1</p>	<p>Incorrect calculation of Ancillary Service settlement amounts for October and November 2017 (RCM-related)</p> <p>MR 9.9.3 sets out the calculation of Ancillary Service Payments to market participants. MR 3.22.1(g) requires AEMO to provide a value for Cost_LRD to the settlement system each month. This value is the regulated compensation for provision of Load Rejection Reserve, Spinning Reserve and System Restart Services.</p> <p>This parameter must be manually entered by the settlement analyst each month, and in October 2017, the value was incorrectly set to zero. On identifying the issue, AEMO amended the entry, and now has a second analyst review all manual entries.</p> <p>Further, as part of the deployment of the new RCM settlement system in November 2017, automated tasks pushing ancillary service data from WEMS to the settlement system were paused, and not restarted. This meant that daily ancillary services payment amounts for the last week of the month were not sent to the settlement system, and two market participants were underpaid as a result. On identifying the issue, AEMO rescheduled the automated tasks and corrected the data.</p> <p>Payments to affected participants were corrected in the next settlement adjustment. While we agree that this action was in line with the market objectives, AS input data is not on the list of items that can trigger a settlement adjustment, so the correction (without a related notice of disagreement) is a subsequent non-compliance.</p>	<p>Consider a rule change proposal to extend the list of data changes that can trigger a settlement adjustment.</p>

13 WEM RULES CHAPTER 10 – MARKET INFORMATION

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

13.1 RULE AMENDMENTS

Amendments to Chapter 10 of the WEM Rules include:

- minor cosmetic changes to clarify rule intent.
- transitional changes to reflect the wind-up of the IMO.
- New data publication requirements relating to DSPs and Refund Exempt Planned Outage Counts

13.2 AEMO PROCEDURES

AEMO's Internal Procedures are compliant with Chapter 10 of the WEM Rules in all material respects.

13.3 OPERATIONAL COMPLIANCE WITH CHAPTER 10

13.3.1 Audit activities

We have reviewed AEMO's website and AEMO's procedures to determine compliance and compliance risk associated with its Market Data publication obligations under clause 10.5.1 of the WEM Rules.

13.3.2 Audit findings

Instances of non-compliance and areas of compliance risk associated with Chapter 10 are summarised in the table below.

Table 18: Operational compliance findings associated with Chapter 10 of the WEM Rules

Ref	Issue Type & Obligation	Risk & Compliance Ratings	Finding	Recommendation
18WEM1.02	Issue Type RBP reported non-compliance Obligation 10.5.1(zl)	Risk Rating Low Compliance Rating 1	AEMO is not publishing REPO Count information 10.5.1(zl) requires AEMO to publish the Refund Exempt Planned Outage Count for each Schedule Generator for each of the most recent 1,000 Trading Days. AEMO is currently publishing REPO Count data only for facilities which have a planned outage that day. The impact is minimal, as REPOCount does not change unless a facility has a planned outage. Nevertheless, finding REPOCount for an individual facility would require a user to find the final day of the most recent planned outage for that facility. AEMO has developed and tested software changes to publish the correct data.	Include this software change in an upcoming release.

14 MARKET SYSTEMS AND SOFTWARE MANAGEMENT

PROCESSES

This chapter covers the compliance of AEMO's market software and software management processes with the WEM Rules, in accordance with clause 2.14.3(c) of the WEM Rules.

- Section 14.1 sets out our review of AEMO's market software systems
- Section 14.2 sets out our review of AEMO's general IT controls, including processes for software management.

14.1 COMPLIANCE OF AEMO SOFTWARE

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

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

- WEMS
- POMAX Settlements
- POMAX Metering

We are currently carrying out initial certification testing of the Real Time Dispatch Engine software used by AEMO System Management to generate a security constrained dispatch from the unconstrained BMO.

14.1.1 Approach

Software testing and certification under clause 2.36.1(d) of the WEM Rules is carried out on a release by release basis throughout the year. Hence, at the time of the annual market audit, we rely upon the testing conducted throughout the year and our review of AEMO'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 WEM Rules and Market Procedures.

14.1.2 2017-18 market software certification

Certification of core market systems

The initial versions of AEMO’s WA market systems were certified at market start in 2006/7. Since that time, various system changes have been made and certified, as set out in Section 15.2.

For this audit, we reviewed the release notes for all changes made to AEMO’s market systems during the Audit Period. 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 19, 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 19: Changes to AEMO market systems in the Audit Period

System	Version number	Release date	Material effect on prices / quantities?	Certification status	Comment
RTDE	1.27-1	n/a	Yes	Certified	First certification of system already in production
RCM	1.0-1803	Aug-17	Yes	Certified	
Metering	11.0.35	Sep-17	Yes	Certified	
WEMS	3.21-1236-20	Sep-17	No	Maintained	
RCM	1.1-2098-8	Sep-17	Yes	Certified	
WEMS	3.22-1297-5	Sep-17	Yes	Certified	
RCM	1.2-2176-5	Sep-17	Yes	Certified	
Settlements	3.4.17	Oct-17	No	Maintained	
RCM	1.3-2272-1	Oct-17	Yes	Certified	

Settlements	3.4.18	Nov-17	Yes	Not Certified	Conscious decision not to certify due to resource shortage – See finding 18WEM1.12
WEMS	3.23-1336-1	Nov-17	No	Maintained	
RCM	1.4-2366-2	Nov-17	Yes	Certified	
Settlements	3.4.21	Feb-18	No	Not Certified	No current certification due to non-certification of version 3.4.18
WEMS	3.24-1356	Feb-18	No	Maintained	
RCM	1.5-2570	Feb-18	No	Maintained	
Settlements	3.4.22	Mar-18	No	Not Certified	No current certification due to non-certification of version 3.4.18

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

Certification of tools outside core market systems

In addition to certification of core market systems, RBP has certified changes to supporting tools as shown in Table 20.

Table 20: 2017-2018 supporting tool certification

System	Version number	Certification scope	Date certified
SPARTA	2.0-375	Calculation of Net Non-STEM Settlement Amount (Market Rule 9.14.1), GST (MR 9.1.2), Interest (9.1.3), and Invoiced Not Paid (INP) amounts	Nov-18

14.1.3 Compliance of market software with the WEM Rules

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

14.2 SOFTWARE MANAGEMENT PROCESSES

Software management processes are also reviewed in the Gas audit. We carried out a single review covering both audits.

14.2.1 Audit activities

We reviewed AEMO's policies and procedures for:

- Business continuity
- Service management (including AEMO/Western Power service management integration workflows, and Western Power service management procedures)

14.2.2 Management of market software

AEMO's obligations in respect of software management processes are specified in clause 2.36.1 of the WEM Rules.

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:

- a. 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;
- b. 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;
- c. ensure that appropriate testing of new software versions is conducted;
- d. 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
- e. 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.

Clause 2.36.2 of the WEM Rules 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

14.2.3 Audit Findings

Compliance of market software

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 14.1.2, the core market systems and the non-core market software referenced in Section 14.1.2 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) of the WEM Rules) and non-core market software referenced in Section 14.1.2 to be compliant with the WEM Rules and Market Procedures, in all material respects.

Compliance of software management processes with the WEM Rules

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

AEMO's software management processes for the market systems remain sufficient to comply with the market rules.

Table 21: Comment on AEMO’s compliance with clause 2.36.1 of the WEM Rules during the Audit Period

Clause	Comment on compliance
2.36.1(a)	AEMO 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, ServiceNow records and database entries.
2.36.1(b)	AEMO 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.
2.36.1(c)	AEMO has conducted appropriate testing on all new releases of market software prior to their being placed in service.
2.36.1(d)	AEMO has ensured that all software versions are covered by an independent certification prior to implementation, with the exception of POMAX settlements version 3.4.18 and all subsequent versions to the end of the audit period – see finding 18WEM1.12
2.36.1(e)	AEMO provides documentation to Market Participants covering the functionality of the market software. AEMO also holds release artefacts including detailed release notes for each release, which are available to Market Participants.

General findings

Table 22: Operational compliance findings associated with software management processes

Ref	Issue Type	Risk & Compliance Ratings	Finding	Recommendation
17WEM2.40	<p>Issue Type RBP reported compliance risk (Recurring issue)</p>	<p>Risk Rating Low</p> <p>Compliance Rating 2</p>	<p>Business continuity exercises are limited to system failovers</p> <p>AEMO maintains redundant IT systems, so that the market can continue to operate in the event of losing one data centre. Both data centres are regularly exercised, by running production market systems from each location at regular intervals. While this is perhaps the most critical part of AEMO's business continuity preparation, other aspects of business continuity have not been explored.</p> <p>Since the last audit, AEMO has created Business Continuity Plans documentation for each operational team. Two incidents affecting the control room have required execution of part of the BCP (and improvements to the plan have been identified as a result), but there is no overall BC testing schedule. This means that reliance on key people, office premises, physical equipment, and communications channels has not been tested.</p> <p>Further, because Dispatch Advisory tools rely on system availability, in some situations, a DA will only go out once the backup control centre is up and running, so participants may not know of issues until they have been resolved.</p>	<ol style="list-style-type: none"> 1. Plan and conduct regular desk-based and live business continuity exercises covering selected credible contingency scenarios 2. Consider how to notify participants of BCP execution before not after the situation has been resolved.
18WEM1.1	<p>Issue Type RBP reported</p>	<p>Risk Rating Medium</p> <p>Compliance</p>	<p>Settlement processes using new RCM systems have increased complexity of process and systems</p> <p>AEMO implemented new software for Reserve Capacity Mechanism settlement in late 2017.</p>	<p>Ensure legacy system retirement and remediation is explicitly included in plans for WEM system evolution</p>

Ref	Issue Type	Risk & Compliance Ratings	Finding	Recommendation
	compliance risk	Rating 2	<p>The new system has replaced some - but not all - of the legacy settlement system. This means settlement processing is more complex, as activities are split over multiple systems and there are more transfers and transformations of data between systems.</p> <p>While the software calculates settlement amounts correctly, the operations team has identified several bugs in the process flows preparing and transferring input and output data between systems. For example, in our observation of settlement processing activities, the settlement analyst had to deal with two problems affecting the processing workflow between systems. One was resolved by clarifying process steps in internal documentation, and the other was a software defect.</p> <p>As the suite of market software ages, historic detritus builds up. Having two settlement systems is one example, and there are also multiple energy market systems. On a lesser scale, legacy participant identifiers are too difficult to change, there are still settlement products and usernames named for the former IMO, and the new systems do not retain user-level audit records of who performed specific actions. Over time, workarounds and relics of old systems and processes increase the complexity and risk in the process. It is critical that AEMO continue to modernise and refresh systems to reduce this complexity, with clear options to address the legacy issues and systems, even if they are dependent on the path taken in ongoing market reform.</p>	
18WEM1.12	Issue Type RBP reported non-compliance	Risk Rating Low Compliance Rating 1	<p>MR 2.36.1(d) requires AEMO to ensure that any versions of software used in the settlement process to be independently certified.</p> <p>A lack of software testing resources within AEMO has resulted in the RCM version of POMAX being released and in production since December 2017 without regression testing or certification. At the time of this version being released, we</p>	<p>1. Recruit and train sufficient resources to meet current and near future needs, with urgency.</p>

Ref	Issue Type	Risk & Compliance Ratings	Finding	Recommendation
	Obligation 2.36.1(d)		<p>discussed the situation with the AEMO, and agreed that the release should proceed as a conscious decision, given the lack of testing resource and the importance of the release. However, this was on the understanding that the testing would proceed as soon as practicable.</p> <p>The lack of regression testing and certification increases the risk that the current version of POMAX in production contains material errors.</p> <p>The demand for testing resource is certain to increase with the System Management software tools coming in-house. In addition, there has been no regression test or integration test of GIA software.</p>	<p>2. Regression test and arrange independent certification of POMAX as soon as possible.</p> <p>3. Test GIA software as soon as possible.</p>

15 APPENDICES

15.1 COMPLIANCE AND RISK RATING INFORMATION

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

15.1.1 Compliance and Risk Ratings

Audit findings are categorised as follows:

Table 23: Compliance ratings

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

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

Table 24: Risk Ratings

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

Table 25: 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

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

15.1.2 AEMO likelihood ratings

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

15.1.3 AEMO impact ratings

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

Type of impact	EXTREME	MAJOR	MODERATE	MINOR	IMMATERIAL
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

15.2 HISTORICAL MARKET SOFTWARE CERTIFICATION PRIOR TO THE 2017-18 AUDIT PERIOD

15.2.1 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, RBP 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. We then review the test results to determine whether the results are compliant with the requirements of the WEM Rules and Market Procedures.

15.2.2 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 process. The second exists where such a change control process is lacking.

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

- Examining 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 WEM Rules and Market 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 WEM 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.

15.2.3 Summary of historic tests

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. Comprehensive testing of new WEMS components was carried out for the introduction of balancing and load following markets in 2012.

POMAX 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 2011-2017 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.

System	Subject	Test	Result	Year
Market Systems	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

System	Subject	Test	Result	Year
Market Systems	Non-STEM	Prudential Requirements calculation	PASS	2008
Market Systems	STEM	Inclusion of more than 50 participants in STEM auction and dispatch merit order calculations	PASS	2011

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
WEMS	3.3.12	No	Maintained
WEMS	3.4.11	Yes	Certified

System	Version number	Changes to calculations affecting market outcomes?	Certification status
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
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
WEMS	3.11.374-116	No	Maintained
WEMS	3.11.374-128	No	Maintained
WEMS	3.12-913-9	Yes	Certified
WEMS	3.12-913-35	No	Maintained
WEMS	3.13-981-1	No	Maintained

System	Version number	Changes to calculations affecting market outcomes?	Certification status
WEMS	3.13-981-6	No	Maintained
WEMS	3.14-1016-3	No	Maintained
WEMS	3.14-1016-4	No	Maintained
WEMS	3.16-1105-2	Yes	Certified
WEMS	3.17-1149-11	Yes	Certified
WEMS	3.18-1183-5	No	Maintained
WEMS	3.19-1192-10	No	Maintained
WEMS	3.19-1192-13	No	Maintained
Metering	11 update 14	Yes	Certified
Metering	11.0.20	No	Maintained
Metering	11.0.25	No	Maintained
Metering	11.0.27	No	Maintained
Metering	11.0.28	No	Maintained
Settlements	3.4.6	Yes	Certified
Settlements	3.4.7	No	Maintained
Settlements	3.4.8	Yes	Certified
Settlements	3.4.9	No	Maintained
Settlements	3.4.12	No	Maintained
Settlements	3.4.16	Yes	Certified