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AUSTRALIAN ENERGY MARKET OPERATOR

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

6 DECEMBER 2021

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Document version: 2.6 FINAL

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EXECUTIVE SUMMARY

This independent assurance report sets out the results of the market audit by Robinson Bowmaker Paul (RBP). The audit assesses AEMO's compliance with the Wholesale Electricity Market Rules (WEM Rules) and WEM Procedures for the period 1 July 2020 to 30 June 2021, both dates inclusive.

REGULATORY CONTEXT AND SCOPE

Regulatory context

The regulatory context for the audit is summarised in Table 1.

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: • The compliance of AEMO's Internal Procedures and business processes with the WEM Rules • AEMO's compliance with the WEM Rules and WEM 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 WEM Procedures and Internal Procedures that have changed during the Audit Period.
- Software Compliance Assessment
- Review of General IT Controls.

KEY THEMES AND FINDINGS

Improvements in mitigating adverse impacts of Spinning Reserve shortfalls

Last year we noted a potentially worsening trend with respect to Spinning Reserve shortfalls. AEMO has since analysed historical shortfall data and developed a number of metrics that provide a useful and informative summary of shortfall trends. While shortfalls are still occurring, AEMO's analysis indicates a downward trajectory across all metrics including:

- A slight decline in the trend of the longest continuous shortfall, with individual events still resulting in outliers. Longest continuous shortfalls have been as long as 60 minutes.
- A slight downward trend in maximum MW shortfall has trended marginally downwards. The maximum shortfall has been as high as 70% of the requirement[1].

[1] The analysis conducted by AEMO include post-contingent intervals (i.e. intervals during which a contingency had manifested, with Spinning Reserve being used up to restore frequency), As such the largest maximum shortfall noted here may be over-estimated.

- A reduction in the trend of minutes per week for which a violation in Spinning Reserve quantities was recorded. Violation minutes per week have been as high as 90-120 minutes per week during the audit year.
- A reduction in the trend of minutes (per week) for which a violation in Spinning Reserve quantities was recorded (average 35 minutes to ~20 mins)

The prevalent causes of shortfalls appear to be:

- The largest contingency being set by the Yandin and Warradarge wind farms in North Country.
- Volatility from intermittent generation. During such volatility, some of the Spinning Reserve will be used up to provide LFAS Up leaving a shortfall in Spinning Reserve.
- Rooftop PV volatility, which likewise means Spinning Reserve is being used up as a result of LFAS up provision.

AEMO has taken multiple mitigating actions to reduce the severity of the above Spinning Reserve shortfalls with a view to preventing Under-Frequency Load Shedding (UFLS); this includes improvements to Generator Interim Access (GIA) dispatch, and modification and increased use of the Real Time Frequency Stability (RTFS) tool to increase visibility of potential adverse impacts. This is further described in 21WEM1.59 (in the body of this report).

Hence, notwithstanding the on-going shortfalls, we have concluded that AEMO has appropriate mitigating controls in place to ensure power system security and reliability.

Recurring LFAS shortfalls

As in previous years, we have noted multiple instances of AEMO not activating sufficient Load Following Ancillary Services (LFAS) leading to shortfalls. This is a historical and systemic issue that arises as a result of deficient controls pertaining to the manual dispatch of Synergy facilities. The deficiency manifests as follows: when an independent LFAS provider changes its bid such that Synergy's cleared LFAS increases in the LFAS Merit Order, this change is not immediately visible to the controller because of the nature of the display of the System Operator Controller User Interface (SOCCUI). While there are other controls to alert a controller that a shortfall has occurred, these are reactive; hence, by the time the controller is alerted, the shortfall has already occurred. While the majority (more than 60%) of shortfalls are immaterial in nature e.g., 0-10MW, there have been instances where the shortfalls have been material, including a small number of instances in which the shortfall was greater than 30MW. Of particular note, were two shortages of LFAS Up of 39MW

(20 June 2020, 17:30[2]) and 49MW (5 September 2020, 19:30); the former shortfall occurred during the evening ramp when solar PV output is declining. Other shortages were noted during the morning and evening ramps, but the magnitude of these shortfalls was minor or immaterial.

As noted above, the root cause of this issue pertains to the control deficiency described above, and until the control is fixed these shortfalls are almost certain to recur (as evidenced by multiple breaches over multiple years). Note that the magnitude of the shortfall is unrelated to the likelihood of recurrence because of the manner in which the shortfalls manifest. We have therefore rated the LFAS breaches as medium risk due to the systemic and historical nature of these breaches, and the potential for material shortfalls to occur if the issue is not rectified. AEMO has advised that they plan to rectify the SOCCUI display issue by the end of the 2021 calendar year; this should significantly decrease the likelihood of similar breaches recurring in the future.

It is worth noting that in most cases AEMO is able to mitigate any adverse impacts of LFAS shortfalls on power system security by re-dispatching Synergy (because of the nature of portfolio dispatch). However, this is an undesirable outcome from a markets perspective, as it involves dispatching energy to meet an ancillary services requirement (thereby compromising the productive efficiency of the market).

See also 21WEM1.37 in the body of this report.

Opportunity to improve control environment in power system operations area

There are opportunities to strengthen the control environment in the power system operations area in a manner that facilitates audit. For example, System Management[3] has a large number of procedural artefacts; however, during the audit it was unclear which procedures best reflected operational practice. This limited the value of the System Management audit as our audit procedures largely involved verbal assertions by staff on what they do, as opposed to auditing whether staff applied documented controls in practice, and whether those controls were effective (which is the approach we have used for WA markets). A rationalisation would be useful whereby all procedures/instructions that do not reflect operating practice are removed.

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[2] This breach occurred in the previous audit period but was not reported until the current audit period.

[3] As part of the WEM reform rule amendments which commenced on 1 February 2021, all references to System Management have been removed and replaced with AEMO. For ease of reference, we continue to use the term System Management in this audit report to refer to the AEMO teams responsible for power system operations.

There is also opportunity to improve the documentation of controls and maintenance of audit trails to facilitate audit[4]. Historically, much of System Management's obligations have been discretionary in nature by virtue of the manner in which Synergy's portfolio is dispatched. As such the documentation of controls and maintenance of audit trails have not been as sophisticated as what we have observed in the WA Markets space. In the new WEM, however, AEMO will have more stringent obligations to be transparent about process and give reasons for dispatch decisions, and its dispatch decisions may have material impacts on the proper functioning of the market. For example:

- AEMO will need to justify its rationale for varying output on a Dispatch Instruction.
- AEMO will be required to document a WEM Procedure that sets out how they will determine who to direct in a Low Reserve Condition.
- AEMO's decisions around which constraint sets to use will have a direct impact on the quantum of Uplift Payments (payable to negatively mispriced generators), which may end up triggering the Non-Co-optimised Essential System Services (NC ESS) process.

As such, it will be important that AEMO maintains a robust control environment that facilitates audit and transparency.

Effective testing and verification Controls in Market Operations area

Many of the self-reported breaches in the Market Operations area relate to pre-existing errors that were detected by AEMO by implementing the following controls:

- The Settlements verification processes (which we reviewed as part of this audit)
- Systems testing as part of software development projects (e.g., the RoPE implementation project and Settlement Enhancements implementation project).

The errors that have been detected are described in the following findings:

- 21WEM1.30: Multiple Settlement Implementation Issues
- 21WEM1.32: Error in Ancillary Service Cost Recovery calculation in Settlements
- 21WEM1.35: Incorrect loss factors applied to Notional Wholesale Meter for IRCR calculation
- 21WEM1.52: Failure to recalculate Relevant Demand flowing a Consumption Deviation Application resulting in incorrect NSTEM Settlement calculations.

[4] See 19WEM1.61, 21WEM1.40, 21WEM1.42, 21WEM1.46, 21WEM1.47 and 21WEM1.54 in the body of this report.

The fact that these issues were self-detected by AEMO speaks to the effectiveness of the Settlements verification and systems testing controls that AEMO have implemented.

It should be noted that AEMO's Settlement verification controls do not provide an absolute level of assurance of correct Settlements results. This is evidenced by the fact that some of the above issues are historical, having occurred for multiple years before being detected this year. The nature of the verification checks that have been implemented, such as comparing settlements results to the previous Settlement period's results and investigating significant changes, may not detect minor errors, or systemic issues that affect each Settlement period's results to a similar degree. However, the cost of implementing systems and procedures that would provide a significantly higher level of assurance would be prohibitive, so we conclude that AEMO is taking a reasonable approach. AEMO's internal controls and certification and audit as external control should manage residual risk to an acceptable level.

Inconsistent approach to recording self-reported breaches

The self-reported breach 21WEM1.30 (Multiple Settlement Implementation Issues) is a single breach that reports 5 separate settlement issues, the common thread being the fact that all 5 were detected as part of the Reduction of Prudential Exposure (RoPE) project. Conversely, there are 14 separate self-reported breaches due to a failure to activate sufficient LFAS, each being a separate instance of the same issue.

This inconsistency has two undesirable implications:

- Comparing numbers of breaches year-on-year or across different business areas is less meaningful, as they have not been recorded on a consistent basis.
- Where multiple issues within the same self-reported breach have different resolutions, it becomes difficult to clearly track the resolution of the issues.

We recommend that AEMO implement a clear policy that each individual issue is recorded as a separate self-reported breach.

This issue should be borne in mind when considering the numerical summaries of findings presented in the following section. In Table 3 below, we present the number of findings if 21WEM1.30 had been reported as five separate breaches.

Summary of findings

There has been an increase in the overall number of findings over the previous year, including a significant increase in the number of medium risk findings. This is largely driven by the large number of instances of insufficient LFAS activation; 14 of the 20 Medium risk findings relate to this single issue.

There have been no high-risk findings identified this audit year.

Table 2: Audit findings identified during audit period by risk rating: 2018/19, 2019/20 and 2020/21

	2018/19	2019/20	2020/21			
Risk Rating	Total	Total	Total	Finding Type		
				Breaches[5] - reported by		Control Observations[6]
				AEMO	RBP	RBP
High	7	1	0	0	0	0
Medium	15	6	19	16	1	2
Low	21	45	39	26	5	8
Totals	**43**	**52**	**58**	**42**	**6**	**10**

Table 3. Number of audit findings if 21WEM1.30 had been reported as five separate breaches

	2018/19	2019/20	2020/21			
Risk Rating	Total	Total	Total	Finding Type		
				Breaches[7] - reported by		Control Observations[8]
				AEMO	RBP	RBP
High	7	1	0	0	0	0

[5] Findings that are instances of non-compliance with the WEM Rules

[6] Findings that are not instances of non-compliance with the WEM Rules, but which pose compliance risk (Rating 2) or are opportunities for improvement which do not affect compliance risk (Rating 3)

[7] Findings that are instances of non-compliance with the WEM Rules

[8] Findings that are not instances of non-compliance with the WEM Rules, but which pose compliance risk (Rating 2) or are opportunities for improvement which do not affect compliance risk (Rating 3)

Medium	15	6	19	16	1	2
Low	21	45	43	30	5	8
Totals	**43**	**52**	**62**	**46**	**6**	**10**

Table 4: Audit findings movement

Finding status	Risk Rating			Total
	High	Medium	Low	
Open @ 01/07/2020	2	5	16	**23**
Add: New findings (01/07/20 – 30/06/21)	0	19	39	**58**
Less: Closed findings (01/07/20 – 30/06/21)	2	5	35	**42**
Open @ 01/07/2021	0	20	19	**39**
Prior year findings	0	1	5	**6**
Current year findings	0	18	15	**33**

Figure 1: Audit findings by risk rating and observation type: 2017/18 - 2020/21

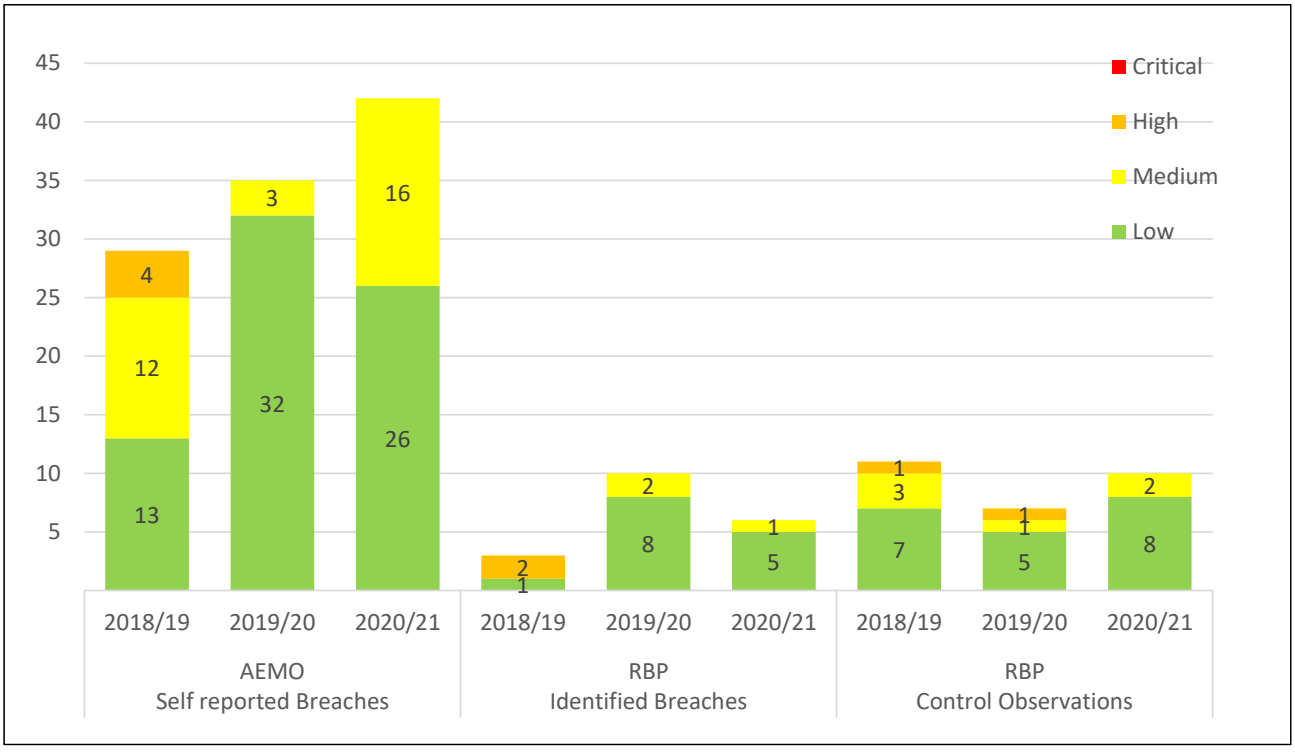

Table 5: Summary of audit findings identified by RBP during the current audit period 2020/21

Area	Process	Finding Type	Risk Rating	Ref#	Finding
System Management	Real-time dispatch (Ancillary Services)	Breach	Medium	21WEM1.37	Failure to activate sufficient LFAS
	Training	Control	Medium	21WEM1.48	No simulator training conducted for controllers on an ongoing basis, and no access to simulator for assessment purposes until new EMS system is implemented
	Real-time dispatch (Ancillary Services)	Control	Medium	21WEM1.53	No formalised control to mitigate against incorrect Spinning Reserve activation due to fragmented Control Room tool kit.
	Planning	Breach	Low	21WEM1.38	GPS communication protocol not finalised
	Planning	Control	Low	21WEM1.40	Opportunity to improve audit trails for System Restart Testing processes
	Planning	Control	Low	21WEM1.42	No formal processes to investigate dispatch non-compliance
	Real-time dispatch	Breach	Low	21WEM1.45	Failure to issue Dispatch Advisory
	Real-time dispatch	Control	Low	21WEM1.46	Approach to dispatching marginal intermittent generators is not formalised
	Planning	Control	Low	21WEM1.47	No formalised process for reviewing impacts of Commissioning Test Plans on system security
	Planning	Control	Low	21WEM1.54	Formalised operational plans for AUFLS implementation do not exist
	Real-time dispatch	Control	Low	21WEM1.57	Control Room quality assurance controls are not being applied regularly
	Real-time dispatch (Ancillary Services)	Control	Low	21WEM1.59	Continuing Spinning Reserves shortfalls
	Market Information	Control	Low	21WEM1.69	Incorrect Outage Data published on WEM Market Data webpage
	Real-time dispatch	Breach	Low	21WEM1.74	Accumulated Time Error exceeded allowable threshold
Mark ets	STEM	Breach	Low	21WEM1.49	Errors in calculation of Alternative Maximum STEM Price since September 2020

Area	Process	Finding Type	Risk Rating	Ref#	Finding
	Reserve Capacity	Breach	Low	21WEM1.52	Failure to recalculate Relevant Demand flowing a Consumption Deviation Application resulting in incorrect NSTEM Settlement calculations.

Audit findings open from prior years and self-reported breaches are listed in the detailed audit report and reported to management on a monthly basis and to the RAC each quarter.

OPINION

Note: Audit activities regarding compliance with WEM rules section 3.8A and Appendix 3B are ongoing. Consequently, the following opinion is subject to change.

Qualifications

We have not noted any instances of material non-compliance with the WEM Rules; our definition of materiality is set out in the detailed audit report.

Conclusion

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

Subject to the inherent limitations set out in the detailed audit report, 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 WEM Procedures during the Audit Period, in all material respects.

Subject to the inherent limitations set out in the detailed audit report, 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 the detailed audit report, 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 WEM Procedures during the Audit Period in all material respects.

CONTENTS

1 INTRODUCTION

This chapter sets out the regulatory context for the market 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 2020 to 30 June 2021, 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 market 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 6: 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: • The compliance of AEMO's Internal Procedures and business processes with the WEM Rules. • AEMO's compliance with the WEM Rules and WEM 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 market 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 market 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.
- Procedures Assessment of WEM 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 results of the STEM run outputs for Trading Week 19 of the Audit Period as produced from AEMO production systems in that Trading Week 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 WEM Procedures (referred to as the *WEM Procedures*) is the Wholesale Electricity Market Rules dated 1 February 2021 (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 WEM 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 7: Procedures reviewed to assess control application

AEMO functional area	Procedures against which control application has been assessed
Market Operations	Settlements and Daily Operations Procedure and related Confluence work instructions
Reserve Capacity	Certification of Facilities Procedure, Reserve Capacity Testing Procedure, Relevant Demand and CDA Procedure, Certification of Reserve Capacity, Undertaking the Long Term PASA and conducting a review of the Planning Criterion and related Confluence work instructions
Finance	Internal Procedure: Fees
System Management Operations Governance and Integration	Internal Procedure - Tolerance Ranges Internal Procedure - Manage Rule Participant Compliance
System Management - Real Time Operations	Internal Guideline - Backup Load Following Ancillary Service Management of LFAS interaction with GIA Internal Guideline: Power System Security Management Ideology

AEMO functional area	Procedures against which control application has been assessed
System Management - Power System and Market Planning	Internal Procedure - Black Start Testing Internal Guideline - Equipment List Internal Guideline - FAQ for Commissioning Internal Procedure - Transmission Network Planned Outages
Risk & Compliance	AEMO Data Breach Response 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 and WEM Procedures with the WEM Rules.
- We provide limited assurance under this standard with respect to our review of:
  - AEMO's compliance with the WEM Rules and WEM 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 8: 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	**High**: 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 areas for improvement 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 17.1 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 WEM 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 WEM 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 WEM Procedures, Internal Procedures[9] 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 WEM Procedures and to determine the effectiveness of operating controls. In doing so, we have sourced information from all AEMO (WA) teams.

The first three activities were conducted through interviews and business process walkthroughs via teleconferencing[10]. Remaining activities have been undertaken via desktop analyses.

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
    - Market Operations
        - Settlements verification
        - Daily operations - STEM, Balancing & LFAS Markets
        - Registration
        - Monthly calculation of Alternative Maximum STEM Price

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

10 Covid-19 restrictions meant that a site visit was not possible for this audit.

- Reserve Capacity
    - LT PASA and ESOO
    - Facility Performance Monitoring
    - Monitoring the effectiveness of the WEM

- Electricity System Operations
    - System Management Operations:
        - Updating and maintenance of Tolerance Ranges
        - Outage Data maintenance
        - Participant compliance monitoring
        - Commissioning - administrative processes
    - Dispatch, including:
        - Contingency classification and reclassification framework
        - Frequency Operating Standards
        - Ancillary services dispatch
        - Control room tool kit
        - Controller training framework
        - Fatigue management procedures
    - Dispatch planning, including:
        - Generator Performance Standards
        - PASA
        - Maintenance of Equipment List
        - Commissioning - test plan review and approval
        - System restart 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 WEM 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 15 present our audit findings relating to the Compliance Assessment and Procedures Assessment work streams on an WEM Rule chapter by chapter basis.
- Chapter 1 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

Changes to Chapter 1 are summarised below.

Rule change	Nature of changes
Minister amended rules - Distributed Energy Resources Register (DER) and Roadmap implementation	Transitional provisions to allow DER roadmap cost recovery in AEMO budget
RC_2019_05: Amending the Minimum STEM Price definition and determination	Transitional provisions for first review of Minimum STEM Price
Minister amended rules - Tranche 1, Schedule A (WEM reform)	Transitional provisions to enable AEMO to develop transitional procedures to effect Tranche 1 Amending Rules
Minister amended rules - Tranche 2 & 3, Schedule A (WEM reform)	Transitional provisions to enable AEMO to develop transitional procedures to effect Tranche 2 & 3 Amending Rules Transitional provisions relating to the deferral of the 2021 and 2022 Reserve Capacity Cycles
Minister amended rules - Tranche 1, Schedule B, Part 2 (WEM reform)	Transitional provisions governing Generator Performance Standards (GPS) for Existing Transmission Connected Generating Systems Transitional registration provisions to facilitate 2021 and 2022 Reserve Capacity Cycles

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

Where relevant, we have audited transitional obligations placed on AEMO. These audit procedures are described in the relevant chapter to which they pertain (e.g., audit procedures pertaining to transitional provisions for Generator Performance Standards (GPS) are reported in Section 5 covering Chapter 3A 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

Changes to Chapter 2 are summarised below.

Rule change	Nature of changes
Minister amended rules - Constraints framework and governance	Development of constraints library and Congestion Information Resource to support WEM reform (implementation deferred under transitional provisions)
RC_2018_05: ERA access to market information and SRMC investigation process	Clarification of AEMO obligations to provide ERA access to information for market monitoring purposes
Minister amended rules - Technical Rules Change Management	Amendments to clarify AEMO's role in Technical Rules change process
Minister amended rules - Tranche 1, Schedule B, Part 2 (WEM reform)	Dispute resolution process for Generating Performance Standards

3.2 AEMO procedures

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

3.3 Operational compliance with Chapter 2

3.3.1 Audit activities

We have reviewed:

- Self-reported instances of non-compliance with Chapter 2
- AEMO's processes to monitor Market Participant compliance in accordance with clause 2.13.9. Our review was focussed on AEMO's process for monitoring participant compliance with dispatch instructions and advisories (including compliance with instructions issued during High-Risk Operating States and Emergency Operating States).
- AEMO's processes to update and maintain dispatch Tolerance Ranges under clauses 2.13.6D - 2.13.6K.
- Reviewed AEMO's tools and procedures used for calculating Market Fees.
- Reviewed AEMO's procedures for Monitoring the Effectiveness of the WEM (clause 2.16.1) and the resulting documentation.

Findings pertaining to Chapter 2 of the WEM Rules are summarised below.

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

Ref	Issue Type & Obligation	Risk & Compliance Ratings	Finding	Recommendation
20WEM1.48	**Issue Type** RBP reported compliance risk **Obligation** 2.24.4	**Risk Rating** Low **Compliance Rating** 2	Process for calculating Market Fees Rate has potential for errors Clause 2.24.4 requires AEMO to calculate Market Fee Rates, SM Fee Rates and Regulator Fee Rates at a level that AEMO estimates will earn revenue equal to the relevant revenue estimated determined under clause 2.24.3. Clause 9.13 of the Rules (Market Fee Settlement) applies these rates to the Metered Schedules of Market Generators and Market Customers for cost recovery purposes (note that the Metered Schedules represent loss-adjusted generation or consumption, where the loss adjustment is relative to the reference node (Muja)). AEMO's process for calculating the market fee rate can be improved, as the process is not well documented and the spreadsheet tool used to calculate the fee rate has scope for error due to the nature of manual inputs. In particular: **The methodology for deriving the market fee rates is not well documented and could be misinterpreted and applied incorrectly by an inexperienced staff member.	Closed - appropriate actions have been implemented.

Ref	Issue Type & Obligation	Risk & Compliance Ratings	Finding	Recommendation
			**The nature of the inputs used to derive the market fee rates are not well specified. For example, it is unclear which ESOO demand forecast is to be used. Likewise, it is unclear what data is used to convert the ESOO forecast from sent-out to loss adjusted to the Muja reference node. **The spreadsheet requires significant manual input. For example, variables that should be derived via a formula (e.g., the loss adjusted forecast that the revenue requirement is divided by) is hard coded as a value multiple times in the spreadsheet. The combination of the vague documentation and manual spreadsheet tool increases the risk of the market fee rates being calculated incorrectly.	
21WEM1.62	**Issue Type** AEMO reported non-compliance **Obligation** 2.34.8	**Risk Rating** Low **Compliance Rating** 1	Standing Data change request not accepted within deadline WEM rule clause 2.34.8 requires AEMO to accept or reject a Standing Data change request within 3 business days. A change request was received on 28/05/2020 but was not accepted until 05/06/2020. The cause was that the analyst who was assigned the change request was not familiar with the WEMS MPI, and the Work Instruction did not adequately detail the steps required to confirm a change request had been accepted. AEMO have updated the work instruction to include the step to	Closed - appropriate actions have been implemented.

Ref	Issue Type & Obligation	Risk & Compliance Ratings	Finding	Recommendation
			confirm that a change request has been processed.	
21WEM1.68	**Issue Type** AEMO reported non-compliance **Obligation** 2.40.1	**Risk Rating** Low **Compliance Rating** 1	Participant Prepayment amount applied twice to Outstanding Amount 06/11/2020 – 01/12/2020 Prepayments used to be monitored in a shared inbox by the WA Market Operations team. This led to confusion over whom was responsible for processing the Prepayment. They are now managed in a Jira, and the process has been documented in a Work Instruction to ensure that this does not occur again. The Outstanding Amount calculation is calculated in accordance with WEM Rule 2.40.1. As the WEM settles for months in the past, Participants will have outstanding invoices that are to be paid to AEMO (WEM Rule 2.40.1(a)) and by AEMO (WEM Rule 2.40.1(b)). AEMO Participants have the opportunity to reduce their Outstanding Amount by prematurely paying their upcoming invoice, by submitting a 'Prepayment'. AEMO calculates a Participant's Outstanding Amount taking into account their outstanding invoice, and how much has been prepaid. These prepayments are submitted via email to the wa.operations@aemo.com.au inbox and manually applied by the on-call operator.	Closed - appropriate preventative actions have been completed.

Ref	Issue Type & Obligation	Risk & Compliance Ratings	Finding	Recommendation
			On 06/11/2020, a Prepayment made by a Participant was manually applied twice by two separate operators. This meant that the Outstanding Amount that was calculated was incorrect, as it duplicated the Prepayment amount. This is an irregular occurrence as the circumstances leading up to the duplication are rare. The breach was discovered when the Finance Team notified the WA Market Operations Team of a duplicated payment in the financial system, which was not accounted for in the bank records. The WA Market Operations Team immediately resolved the Outstanding Amount calculation and reversed the Prepayment. We have since improved our processes to robustly assign obligations for Prepayments to individual team members and to keep track of the prepayments in a Jira. As in correctly calculating the Outstanding Amount can lead to further breaches in monitoring Prudentials, the WA Market Operations Team also performed an ex-post analysis to ensure that there was no other breach in the WEM Rules. It was determined that no other WEM Rules were breached from this.	
21WEM1.42	**Issue Type** RBP reported compliance	**Risk Rating** Low **Compliance**	No formal processes to investigate dispatch non-compliance	We recommend AEMO formalise the process used to investigate dispatch non-

Ref	Issue Type & Obligation	Risk & Compliance Ratings	Finding	Recommendation
	risk **Obligation** 2.13.9(j) and (k)	**Rating** 2	Clause 2.13.9 requires AEMO to monitor Rule Participants for breaches of selected WEM Rules including compliance with Dispatch Instructions and Operating Instructions (sub-clause (j)) and directions in Dispatch Advisories (sub-clause (k)). System Management have verbally indicated that this process is conducted by analysing a range of data sources such as the Control Room log and real-time power system data. System Management Operations have also advised that power system controllers will sometimes advise which logged incidents require further investigation. However, no formal process exists (by way of an approved procedure) to investigate potential instances of dispatch non-compliance to determine if a dispatch non-compliance has occurred (to escalate to the Risk & Compliance team and subsequently to the Economic Regulation Authority). The lack of a documented process could lead to incorrect classification of non-compliance if new staff are undertaking the process.	compliance in accordance with clause 2.13.9.

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 amendment

Changes to Chapter 3 are summarised below.

Rule change	Nature of changes
Minister amended rules - Distributed Energy Resources Register (DER) and Roadmap implementation	Addition of new DER Register rules
Minister amended rules - Tranche 1, Schedule B, Part 2 (WEM reform)	New section on Contingency Events (classification and reclassification of Credible Contingency Events)

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 reviewed:

- Self-reported instances of non-compliance with Chapter 3
- AEMO's Ancillary Service dispatch process (covering Spinning Reserve and Load Rejection Service under Chapter 3, and Load Following Ancillary Services (LFAS) under Chapter 7B; LFAS findings are reported in Section 12 of this report)
- AEMO's processes to classification and reclassification of Contingencies under the new framework specified in Section 3.8A of the WEM Rules and the related WEM Procedure. We note that a preliminary version of the WEM Procedure was released in February 2021. A subsequent version is to be published shortly (under the transitional procedure change process) which will include more detail on reclassification scenarios. An Internal Procedure is also under development which will be finalised alongside the second version of the WEM Procedure in August 2021. As at the time of the audit, we note that AEMO did not have a structured process in place to reclassify contingencies (relative to the draft Internal Procedure and the WEM Procedure). AEMO's approach to reclassification has involved monitoring system conditions, discussions with Western Power and the use of controller discretion to reclassify contingencies. Going forward, the process should become significantly more structured and formalised, including the use of historical datasets to inform reclassification decisions, and internal procedures that are more auditable.
- Spinning Reserve and Load Rejection Reserve activation data over the Audit Period.
- AEMO's approach to power system controller training, fatigue management and quality assurance as controls to meet their power system security reliability obligations under Chapter 3, and dispatch obligations under Chapter 7. We have also reviewed rosters to audit whether Fatigue Management Guidelines are being followed. Findings related to these audited procedures are reported in Section 10 of this report.
- AEMO's process for testing System Restart Services providers
- AEMO's process for reviewing and approving Commissioning Test Plans
- AEMO's processes for updating and maintaining the Equipment List (which determines what equipment is subject to the Outage planning process) under clause 3.18.2.
- AEMO's (System Management) processes for managing outage data under Section 3.21.6 (outages being a key input to Reserve Capacity settlement managed by the Market Operations team)
- AEMO's PASA process (using the recently implemented enhanced PASA tool).

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

Ref	Issue Type & Obligation	Risk & Compliance Ratings	Finding	Recommendation
19WEM1.61	**Issue Type** RBP reported area for improvement **Obligation** Ch. 3	**Risk Rating** Low **Compliance Rating** 3	More room for improvement in logbook consistency and review process Control room logbooks are an important control in managing SM Operations risks. Electronic logbooks have been implemented, and guideline documents have been created to ensure effective and consistent logging. The improved logbooks and guidelines have been cited as a control to address multiple findings from previous audits. However, a review of a sample of logbooks has found multiple issues with inconsistent and incomplete application of the logging guidelines, including: - Required events not being logged - Required information not included in logbook entries - Long periods of time with no entries - Inconsistent entries - i.e. the same type of event recorded in different ways on different occasions, or multiple identifiers used for the same facility - Rare and inconsistent use of the Event Type field Consistent logging is important, as implementing some obligations currently requires manual searches through the logbooks - e.g. calculation of dispatch volumes for curtailed facilities (See finding 19WEM1.19 for a breach that was caused by logbook entry being missed). Inconsistent entries make such tasks much more time-consuming and error prone. Consistent logging would	Open - There are long-term initiatives to review decision-making tools (including logging) AEMO-wide, and provision to move to an improved tool in the 3-year budget. Neither of these will be delivered this audit year, so this issue remains open. AEMO has accepted this risk and have entered it into their risk register.

Ref	Issue Type & Obligation	Risk & Compliance Ratings	Finding	Recommendation
			enable some automation to be applied, reducing the risk of errors. In response to these concerns being raised previously, System Management has undertaken a regular review process in which a sample of logbooks are reviewed, and feedback is given to the control room staff. However, the evidence of these reviews provided to us is insufficient to assess the effectiveness of these reviews in addressing these issues. The evidence does not specify which issues the reviewer was looking for or what specific issues were found. There is no indication of a methodology for detecting missing entries being applied. The electronic logbook guidelines could be improved to achieve greater consistency - for example, specifying a specific format for the entry for each event type, and ensuring that the Event Type field is always filled in. Finally, the electronic logbook templates could be improved to enforce greater consistency, while at the same time saving time in creating entries. For example: - Using drop-down lists in the Participant field to ensure consistent identification of facilities - Using pop-up forms to prompt for the required information for particular event types and then automatically create the entry in a consistent format. This would also make it possible to quickly capture information this is currently not captured, such as whether Synergy dispatch in in merit or not. Recommendations: - Create a more complete audit trail for the review of logbooks. Record the methodology employed, the types of issues that were found and follow-up actions - Improve the electronic logbook guidelines to specify consistent entry	

Ref	Issue Type & Obligation	Risk & Compliance Ratings	Finding	Recommendation
			formats for each event type - Improve electronic logbook templates to ensure consistent entries	
20WEM1.01	**Issue Type** RBP reported non-compliance **Obligation** 3.18.11(a)	**Risk Rating** Low **Compliance Rating** 1	DSM availability not taken into account when assessing outages 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. This issue was previously raised (as issue 17WEM2.04) but closed in the 2019 audit as the PASA Enhancement Plan specified that DSM was to be included as part of the PASA enhancement project. This was expected to be delivered during this audit year, and the outcomes of the project were to be a focus area of this audit. However, the PASA enhancement project has been delayed, and will not be delivered in time for us to assess its outcomes as part of this year's audit. Therefore, we are reopening this issue, as it remains unaddressed this audit year.	Closed - AEMO's PASA enhancement project has resolved this issue.
20WEM1.02	**Issue Type** RBP reported non-compliance **Obligation** 3.17.9(f)	**Risk Rating** Medium **Compliance Rating** 1	Forecast transmission capacity between potentially constrained regions is not included in ST PASA report WEM Rule clause 3.17.9(f) requires that System Management must include "transmission outages of which System Management is aware, forecast transmission capacity between potentially constrained regions, and any constraints that are likely" in the ST PASA report. From our review of ST PASA reports, and walkthrough of the ST PASA report creation process, we have found that the forecast transmission capacity	Closed - AEMO's PASA enhancement project has resolved this issue.

Ref	Issue Type & Obligation	Risk & Compliance Ratings	Finding	Recommendation
			between potentially constrained regions information is not included, as there is no system or procedure to insert this information. The report contains relevant fields (INTERREGIONCAPACITY,INTERREGIONLIMIT and GENERATION_CONSTRAINED_QTY), but these are left as 'NA'. This is therefore a breach of rule 3.17.9(f).	
20WEM1.43	**Issue Type** RBP reported compliance risk **Obligation** 3.19	**Risk Rating** Medium **Compliance Rating** 2	When assessing outage applications, process for ensuring sufficient Ancillary Services capacity has high risk of human error. When assessing outage applications, the process for ensuring that there is sufficient remaining capacity for each of the ancillary services is not implemented at all in the PASA tool. The process is a visual check across a grid of outages presented by the PASA tool by the SM Planning staff member, is dependent on that staff member knowing which facilities provide each service (and how much where applicable) and requires that staff member to perform a mental assessment of the outage vs AS requirements. This process is prone to human error and provides no audit trail of the AS assessment.	Recommendation: As part of ongoing PASA enhancement, include systematic check for sufficient AS. This finding will remain open as the Ancillary Services check is still manual and was not automated as part of the PASA enhancement project.
20WEM1.45	**Issue Type** RBP reported compliance risk **Obligation** Ch. 3	**Risk Rating** High **Compliance Rating** 2	Design of GIA constraint implementation threatens power system security GIA constraints have been implemented by the Western Power GIA Tool, which applies the constraints after SM's dispatch decisions. There has been no implementation of GIA constraints in SOCCUI or XA, so SM controllers have no visibility of the impact of GIA constraints before they are applied. Therefore, increasing the dispatch of one facility (to follow an increase in system load) can result in another facility being curtailed, meaning that the increase in generation required to maintain system balance is not achieved. In	Closed - AEMO has implemented measures to mitigate the potential of GIA facilities curtailing during times of system stress. AEMO has also put in place controls to mitigate adverse interactions between GIA and LFAS enablement.

Ref	Issue Type & Obligation	Risk & Compliance Ratings	Finding	Recommendation
			some cases, a significant deficit of generation could result. For example, starting one of the thermal Facilities results in the complete curtailment of a large wind farm. SM Controllers are learning of the impacts of GIA constraints by experience, but given the complex nature of the GIA constraint set, this is not a reliable control. This can leave the controllers in the situation of choosing between out-of-merit dispatch and risking system security, but they have been asked not to use out-of-merit dispatch. A change has been implemented in January 2020 in which the GIA constraint is not applied if the system frequency is outside of a +/-0.2 Hz band around 50Hz. This may address some of the risk, but then leaves the physical constraint that the GIA constraint was intended to address unresolved, which is in itself a risk to system security. AEMO have responded that the GIA tool is a Western Power system, and therefore out of their control. However, the recommendation is not to alter GIA, but to provide the controllers access to tools to mitigate the risk, this is possible, given that AEMO has visibility of the constraint equations used in GIA.	
20WEM1.54	**Issue Type** RBP reported area for improvement **Obligation** 3.11.4	**Risk Rating** Low **Compliance Rating** 3	Worsening Spinning Reserves shortfall situation System Management's weekly SWIS System Performance Monitoring reports show that in every week during the audit year, there have been shortfalls in Spinning Reserves Ancillary Service (SRAS) and violations (in which SRAS dropped below a level 12% under the requirement). From analysing the data from these reports, we found a gradual worsening trend in all three metrics that we analysed: total weekly violation minutes, longest weekly shortfall minutes and maximum shortfall (%). During the audit year, there were 13	Closed - see related finding 21WEM1.59.

Ref	Issue Type & Obligation	Risk & Compliance Ratings	Finding	Recommendation
			instances of a shortfall lasting longer than 30 minutes. As SRAS is an essential service for maintaining system reliability, these worsening trends are a concern. AEMO has analysed spinning reserve trends and noted minor improvements. See 21WEM1.59 for an updated finding on Spinning Reserve shortfalls.	
21WEM1.70	**Issue Type** AEMO reported non-compliance **Obligation** 3.21A.9	**Risk Rating** Low **Compliance Rating** 1	Failure to notify participant of approval of Commissioning Test Plan AEMO failed to notify a Market Generator that the Commissioning Test for their Facility had been approved by 8am on the Scheduling Day for which the Commissioning Test Plan applied. The cause was human error, as the process workflow is manual. The Commissioning Test went ahead as planned; as such there were no adverse impacts on the relevant participant.	Closed - no further action required
21WEM1.31	**Issue Type** AEMO reported non-compliance **Obligation** 3.21.6, 4.12.4(aA)	**Risk Rating** Low **Compliance Rating** 1	Failure to zero out RCOQ of Intermittent Generation when calculating outages Clause 3.21.6 requires AEMO to calculate zero Forced Outage quantities for Intermittent Generators for the purposes of Reserve Capacity refunds, which require AEMO to assume a zero RCOQ for Intermittent Generators (the latter, in accordance with clause 4.12.4(aA). Before the SMST project went live, AEMO manually zeroed out Forced Outages for Intermittent Generators to meet the intent of clause 3.21.6. As part of the SMST project, this calculation was automated. However, due to a bug, on seven Trading Days (between February and March 2021), the Forced Outages of Kalbarri wind farm were not zeroed out.	Closed - no further actions required.

Ref	Issue Type & Obligation	Risk & Compliance Ratings	Finding	Recommendation
			The breach had no settlement impact and was resolved via a system fix on 25 June 2021.	
21WEM1.32	**Issue Type** AEMO reported non-compliance **Obligation** 3.14.1	**Risk Rating** Medium **Compliance Rating** 1	Error in Ancillary Service Cost Recovery calculation in Settlements. WEM rule 4.14.1(i) requires AEMO to calculate the contributing quantity for interruptible and non-dispatchable loads as the absolute value of the sum of the Metered Schedules for the trading month. During certification of Brady Settlement release 3.4.38, it was identified that AEMO's settlement system has implemented the contributing quantity calculation as the sum of absolute values rather than the absolute of the summed values of the metered schedules. An assessment was carried out to calculate the materiality of this non-compliance. It was found that over 2020 the impact would have been a redistribution of approximately $115. AEMO requested a software fix from the vendor to correct the calculation, which was deployed on 10 March 2021.	Closed - no further actions required.
21WEM1.40	**Issue Type** RBP reported area for improvement **Obligation** 3.7.1	**Risk Rating** Low **Compliance Rating** 3	Opportunity to improve audit trails for System Restart Testing processes Clause 3.7.1 of the WEM Rules requires AEMO to make operational plans and preparations to restart the SWIS in the event of a shutdown. As part of this process, AEMO procures System Restart Service from certain Registered Facilities that are able to start without requiring energy to be supplied from a Network, to assist in the re-energisation of the SWIS following a system shutdown. AEMO conducts System Restart Service testing to mitigate the risk that these Facilities are not able (for technical or other reasons) to provide this service when needed.	We recommend AEMO improve the audit trail by: • Amending their process documentation to reflect operational practice more accurately (including documenting the frequency of tests and actual checklist used for individual facilities)

Ref	Issue Type & Obligation	Risk & Compliance Ratings	Finding	Recommendation
			As part of our audit activities, we reviewed AEMO's internal procedure for performing System Restart Service testing and reviewed documentation relating to the testing of three System Restart Service providers over the audit period. AEMO's Internal Procedure contains a high-level checklist of activities that must be completed during a test. A checklist is a key control that assures the robustness of the testing process. However, we noted in our review that the documented checklist was not used in practice, and that each of the three providers had different checklists associated with them with varying levels of detail. Furthermore, completion of checklists was inconsistent, and we could only find evidence that checklists were completed for some tests. As such we were unable to conclude what process had been followed, and whether all required checks were completed as part of the testing. In previous years, we had been advised that AEMO conducts System Restart testing twice a year. However, we were unable to confirm that this is a formalised requirement as the relevant Internal Procedure indicates tests are conducted "as and when required". The inconsistency between documented process and practice, and the lack of an audit trail makes the auditability of AEMO's system restart processes problematic.	• Ensure an audit trail exists by way of completed checklists that show all required steps were completed.
21WEM1.47	**Issue Type** RBP reported area for improvement **Obligation** 3.21A	**Risk Rating** Low **Compliance Rating** 3	No formalised process for reviewing impacts of Commissioning Test Plans on system security During our audit, we were unable to verify whether there is a formalised process in place to review the impacts of Commissioning Test Plans on system security. During interviews, AEMO verbally conveyed the process that engineers typically follow, noting that each assessment is unique, and therefore a process cannot be documented. While the detailed assessment	We recommend AEMO undertake the following to facilitate audit of the relevant controls: • AEMO adapt their existing guidelines to make clear how the security assessment process (for network outage

Ref	Issue Type & Obligation	Risk & Compliance Ratings	Finding	Recommendation
			would certainly be context dependent, it should still be possible to maintain a high level process that sets out high level evaluation criteria, communication/interface requirements with other System Management teams or Western Power, escalation protocols and record keeping requirements (to ensure an audit trail exists; for example SM Planning noted that audit trails may only be available on an exceptions basis, where an issue was noted during the assessment and changes requested). AEMO has advised that the security assessment used in approving Planned Outages of transmission network outages, is also applicable to the assessment performed in approving Commissioning Test Plans. However, as we were not made aware of this during our audit procedures, and as the relevant Internal Procedure does not make clear how the process would be adapted for the purposes of Commissioning Test Plan assessments, we are unable to comment on whether AEMO maintains an adequately robust process for reviewing and approving Commissioning Test Plans.	approval) is applied to the Commissioning Test Plan assessment process. • Maintain a better audit trail
21WEM1.53	**Issue Type** RBP reported compliance risk **Obligation** 3.10	**Risk Rating** Medium **Compliance Rating** 2	No formalised control to mitigate against incorrect Spinning Reserve activation due to fragmented Control Room tool kit. During interview discussing Ancillary Services Dispatch, AEMO noted that during real-time dispatch, there are three separate values of Spinning Reserves produced by XA21, SOCCUI and the Real Time Frequency Stability (RTFS) tool. Given these tools are not fully integrated, there is some risk that the incorrect amount of Spinning Reserve could be activated as a result of relying on a value that is not context appropriate. AEMO has advised that the Control Room monitors the tools in the following order:	We recommend that AEMO formalise the process used to use the information from its toolkit to ensure adequate Spinning Reserves is activated.

Ref	Issue Type & Obligation	Risk & Compliance Ratings	Finding	Recommendation
			• The RTFS tool is checked first to ensure load is not shed should the largest contingency occur. • XA21(second) to ensure AEMO meets the Spinning Reserve standard set out in clause 3.10. • SOCCUI is checked last as it provides an indication of Spinning Reserve requirements; however, this number is known to be erroneous due to historical hard coding. However, no formalised control (e.g. a documented process or guideline) exists to mitigate the risk that Spinning Reserve is under-activated. We note this as Medium risk finding as the probability of this risk manifesting is unlikely (as other controls such as training and qualifications of controllers will mitigate this risk), and an impact rating of moderate-major (were the risk to manifest).	
21WEM1.54	**Issue Type** RBP reported area for improvement **Obligation** 3.6.2	**Risk Rating** Low **Compliance Rating** 3	Formalised operational plans for AUFLS implementation do not exist Clause 3.6.2 requires AEMO to produce operational plans to implement the aggregate under frequency load shedding requirements (as specified in the Technical Rules). The WEM Rules further require that these operational plans must account for sensitive loads and for the rotation of loads between load shedding bands. AEMO has advised that it implements clause 3.6.2 through regular discussions with Western Power, and has: • Provided evidence (via information provided to AEMO by Western Power) that relays were rotated during the audit year.	We recommend AEMO formalise its AUFLS operational plans by documenting it, as a reasonable interpretation of clause 3.6.2 is that a tangible plan should exist. We further note that the Tranche 4B release of reformed WEM Rules will include additional requirements and more substantive guidance for AEMO on its AUFLS obligations, including a requirement to document its AUFLS

Ref	Issue Type & Obligation	Risk & Compliance Ratings	Finding	Recommendation
			• Advised AEMO has been engaging with Western Power to discuss the availability of load available for shedding during different periods of the day and year (to mitigate the impact on the power system if relays disconnect roof-top PV generation during an under-frequency event). However, no formalised documented plan exists to implement AEMO's requirements under clause 3.6.2, or which formalises AEMO's assertions above. The Operating Protocol for AEMO and Western Power addresses AUFLS briefly, reiterating the WEM Rules and noting that AEMO may seek information about relays from time. However, the operating protocol does not cover AEMO's obligations in respect of sensitive loads, and the rotation of loads.	plans. AEMO has advised it is currently working towards ensuring compliance with the upcoming release of those rules. The work being undertaken to implement the Tranche 4B AUFLS rules should address the requirements of this finding.
21WEM1.59	**Issue Type** RBP reported area for improvement **Obligation** 3.11.4	**Risk Rating** Low **Compliance Rating** 3	Continuing Spinning Reserves shortfalls In last year's audit, we noted that spinning reserve shortfalls were potentially worsening and recommended that AEMO analyse the trends (20WEM1.54, now closed). AEMO has analysed spinning reserve trends and provided us their analysis [weekly system reports analysed from Feb 2019 to 30 June 2021]: • There is a slight decline in the trend of the longest continuous shortfall, with individual events still resulting in outliers. Longest continuous shortfalls have been as long as 60 minutes.	We recommend: • AEMO continue to monitor and report on these metrics. • AEMO explore alternative smoothing techniques like a moving average.

Ref	Issue Type & Obligation	Risk & Compliance Ratings	Finding	Recommendation
			• Maximum Shortfall has trended marginally downwards. The maximum shortfall has been as high as 70% of the requirement[11]. • Reduction in the trend of minutes per week for which a violation in Spinning Reserve quantities was recorded. Violation minutes per week have been as high as 90-120 minutes per week during the audit year. • There has been a reduction in the trend of minutes (per week) for which a violation in Spinning Reserve quantities was recorded (average 35 minutes to ~20 mins) In recent times a couple of prevalent causes of shortfalls appear to be: • The largest contingency being set by Yandin and Warradarge. • Volatility from intermittent generation; this means some of the Spinning Reserve will be used up to provide LFAS up. • Rooftop PV volatility, which likewise means Spinning Reserve is being used up as a result of LFAS up provision Additionally, AEMO has taken mitigating actions to reduce the severity of Spinning Reserve shortfalls: • Following the commissioning of Yandin and Warradarge generators, a GIA constraint was developed to ensure that the loss of this contingency would not result in an UFLS event if 70% of spinning	

[11] The analysis conducted by AEMO include post-contingent intervals (i.e. intervals during which a contingency had manifested, with Spinning Reserve being used up to restore frequency), As such the largest maximum shortfall noted here may be over-estimated.

Ref	Issue Type & Obligation	Risk & Compliance Ratings	Finding	Recommendation
			reserve was available. This automatic action reduces the manual intervention required by the controllers to actively manage this, while still taking into account the dynamic nature of the system. • The modification of the Real Time Frequency Stability (RTFS) tool to consider the possible tripping of DPV for a trip of the MARNET scheme, reduces the probability of an UFLS event if this trip were to occur. An alarm was also introduced on XA21 to alert the controllers that additional Spinning Reserve may be required. The RTFS tool enables controllers to perform dynamic analysis of the potential frequency excursion were the largest contingency to manifest) • There is increasing use of the RTFS tool by controllers, so they are aware of when the available Spinning Reserve is inadequate to prevent an UFLS event (and therefore able to take preventive actions). Although ongoing Spinning Reserve shortfalls are still occurring, AEMO's actions should mitigate against adverse power system consequences. We recommend that AEMO continue to monitor and report on these metrics. We note that AEMO is currently using an Ordinary Least Square (OLS) trend line to determine the direction of the trend (the trend directions noted above are based on an OLS fit on the relevant time series). It is worth noting that an OLS trendline may not accurately reflect the underlying trend. As such, we recommend that AEMO explore alternative smoothing techniques like a moving average.	

5 WEM Rules Chapter 3A – Requirements for Transmission Connected Generating Systems

Chapter 3A of the WEM Rules sets out obligations relating to reviewing Generator Performance Standards for Transmission Connected Generating Systems, and on-going compliance monitoring and enforcement.

5.1 Rule amendment

Chapter 3A is a new chapter added as part of the Minister amended rule changes for WEM reform.

Rule change	Nature of changes
Minister amended rules - Tranche 1, Schedule B, Part 2 (WEM reform)	New chapter on Generation Performance Standards and their application to Transmission Connected Generating Systems

5.2 AEMO procedures

AEMO has no Internal Procedures pertaining to Chapter 3A.

5.3 Operational compliance with Chapter 3A

5.3.1 Audit activities

We have reviewed AEMO's current processes for managing its obligations relating to Generator Performance Standards (GPS) for Transmission Connected Generating Systems. AEMO's obligations commenced on 1 February 2021 and pertain to:

- Reviewing proposed alternative standards submitted by participants to Western Power.

- Managing the GPS monitoring and compliance process by way of reviewing and approving Generator Monitoring Plans, monitoring compliance with the plans and reviewing Rectification Plans (where relevant).

AEMO has developed systems to facilitate the initial phase of the GPS process[12].

As at the time the audit was completed, no participants had yet submitted GPS to Western Power for review. AEMO has advised that all participants with existing Transmission Connected Generating Systems will likely seek an extension to submit their Generator Monitoring Plans after 1 August, and that it is likely that no GPS will be submitted to Western Power until well into the next audit period. As such AEMO currently has no formalised processes for implementing the bulk of its GPS obligations as most of these obligations have not yet commenced in practice.

[12] For example, AEMO has recently finalised the GMP form to ensure participants understand the requirements clearly (including clear detailed examples of the type of information that is required). Additionally, AEMO is using an excel based issue tracking tool as a means to liaise with Western Power to facilitate the GPS review process.

5.3.2 Audit findings

We have noted one finding associated with Chapter 3A of the WEM Rules; this is summarised in the table below.

Table 11: Operational compliance findings associated with Chapter 3A of the WEM Rules.

Ref	Issue Type & Obligation	Risk & Compliance Ratings	Finding	Recommendation
21WEM1.38	**Issue Type** RBP reported non-compliance **Obligation** 3A.1.3	**Risk Rating** Low **Compliance Rating** 1	GPS communication protocol not finalised Clause 3A.1.3 of the WEM Rules requires AEMO and Western Power to document a process setting out how information will be exchanged between the two parties (including specification of format and form of information, and timeframes). While a draft GPS consultation guideline has been prepared, it has not yet been finalised as AEMO is awaiting feedback from Western Power. In the meantime, AEMO has developed a temporary procedure to document the interim manual interactions between Western Power and AEMO for the Generator Performance Submissions (GPS) should the GPS system be unavailable from 1 February 2021. It is worth noting that AEMO is complying with the intent of the rule through the formalised manual contingency process and the draft consultation guideline, and that this breach is a technical one.	We recommend AEMO and Western Power finalise the GPS consultation guideline required under clause 3A.1.3 (noting that we understand that AEMO is dependent on Western Power to meet this obligation).

6 WEM Rules Chapter 3B – Frequency Operating Standards

Chapter 3B (and Appendix 13) of the WEM Rules sets out the Frequency Operating Standards that AEMO must operate the SWIS to.

6.1 Rule amendment

Chapter 3B is a new chapter added as part of the Minister amended rule changes for WEM reform.

Rule change	Nature of changes
Minister amended rules - Tranche 1, Schedule B, Part 2 (WEM reform)	New chapter on Frequency Operating Standards (moving the operating standards from the Technical Rules to the WEM Rules, clarifying measurement of standards and island frequency management, and specification of rate of change of frequency (RoCoF) limits)

6.2 AEMO procedures

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

6.3 Operational compliance with Chapter 3B

6.3.1 Audit activities

We have reviewed AEMO's processes to manage their new obligations under the Frequency Operating Standards (FOS). On 1 February 2021, Chapter 3B commenced which included the FOS that AEMO must operate the SWIS. This was previously captured under the SWIS Operating Standards which were contained in the Technical Rules. As part of reform, the FOS has been shifted

to the WEM Rules. The FOS is largely identical to the requirements in the Technical Rules with some exceptions:

- During Credible Contingency Events, AEMO must operate the SWIS to a specified rate of change of frequency (RoCoF) limit of 0.25Hz over any 500-millisecond period (clause 3B.3.5)
- The metric for measuring AEMO's performance with respect to remaining in the Normal Operating Frequency Band (NOFB) (clause 3B.2.1) and Accumulated Time Error requirements (clause 3B.3.1) must be calculated over a 30-day rolling window.
- A new band called the Normal Operating Frequency Excursion Band (NFEB) has been defined. When there is a frequency excursion outside the NFOB, and there has been no Contingency Event, then AEMO must ensure the SWIS frequency remains within the NFEB, and must return to the NFOB within five minutes (clause 3B.3.4).

AEMO has revised its internal reporting to incorporate the new FOS reporting requirements to facilitate compliance monitoring.

AEMO has also modified its Real Time Frequency Stability (RTFS) tool to explicitly monitor RoCoF. Current market and system conditions are such that the risk of breaching the RoCoF Safe Limit is relatively minor; however, the risk is likely to increase over time with increasing penetration of intermittent generation and decreasing system demand. This risk will be managed in the future via the RoCoF Control Service being introduced through WEM reform. In the interim, AEMO will monitor RoCoF through the RTFS tool, and develop mitigating measures on as-needs basis.

6.3.2 Audit findings

One minor instance of non-compliance with Chapter 3B is summarised in the table below.

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

Ref	Issue Type & Obligation	Risk & Compliance Ratings	Finding	Recommendation
21WEM1.74	Issue Type RBP reported non-compliance Obligation 3B.3.1	Risk Rating Low Compliance Rating 1	Accumulated Time Error exceeded allowable threshold Clause 3B.3.1 requires AEMO to maintain system frequency such that the Accumulated Time Error is less than 10 seconds 99% of time over any rolling 30 day period. This requirement came into effect on 1 February 2021, when the new Frequency Operating Standards (FOS, Chapter 3B) commenced. Prior to this period, the relevant time error requirement was in the Technical Rules which also required the Accumulated Time Error to be less than 10 seconds 99% of time; however, no period was specified over which the metric was to be monitored. AEMO has analysed time error data to measure compliance against the FOS for the period of 1 Feb 2021 to 30 June 2021, and against the Technical Rules for the period 1 July 2020 to 31 Jan 2021: • For the period of 1 Feb 2021 to 30 June 2021, AEMO has noted that they were non-compliant with the requirements on June 29 and 30, as the absolute Accumulated Time Error was less than 10 seconds for 98.67% for both days (instead of 99%). Particularly, on June 29, there was an extended period of time when the time error was above 10 seconds; due to the measurement over a rolling 30 day period, this impacted the compliance on 30 June also.	No further actions.

Ref	Issue Type & Obligation	Risk & Compliance Ratings	Finding	Recommendation
			• For the period of 1 July 2020 to 31 Jan 2021, AEMO has noted a potential non-compliance in October 2020 if the time error requirements are measured on a monthly snapshot basis. When measured for the entire seven month period, AEMO noted compliance against the time error requirement in the Technical Rules. No further actions are recommended, as this breach does not require any remedial actions.	

7 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.

7.1 Rule amendments

Changes to Chapter 4 are summarised below.

Rule change	Nature of changes
Minister amended rules - Tranche 1, Schedule B, Part 2 (WEM reform)	"Changes to incorporate new registration taxonomy and new technologies (e.g. Electric Storage Resources and hybrid facilities) into the Reserve Capacity rules, including indicative Facility class assessment process (to facilitate 2021 and future Reserve Capacity Cycles)

7.2 AEMO procedures

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

7.3 Operational compliance with Chapter 4

7.3.1 Audit activities

We have:

- Reviewed self-reported instances of non-compliance with Chapter 4 of the WEM Rules.
- Performed walkthroughs and reviewed procedures relating to Facility Performance Monitoring

- Performed walkthroughs and reviewed procedures relating to LT-PASA and ESOO publication, and reviewed participant data requests and published materials against rule requirements

7.3.2 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
19WEM1.45	**Issue Type** RBP reported area for improvement **Obligation** 4.25.2(a)(ii)	**Risk Rating** Low **Compliance Rating** 3	RC testing Market Procedure is inconsistent with WEM Rules Clause 4.25.2(a)(ii) states that AEMO can test a generation facility by conducting a test in which the facility is deemed to have passed if it is able to perform at or above its Required Level for not less than two Trading Intervals. However, Section 1.8.6 of the RC Testing Market Procedure states that a generation facility is deemed to have passed a test conducted under clause 4.25.2(a)(ii) if its output is at or above its Required Level on average for two consecutive Trading Intervals. The WEM Rules imply that the facility should be able to sustain its output at or above its Required Level for two consecutive intervals (although the term consecutive is not used in the rules). The Market Procedure implies that a facility could have an output below its required level in one Trading Interval, but above in the next so that the average output is at or above the Required Level. This is not consistent with the intent of clause 4.25.2(a)(ii). We further note that the above issue was highlighted during the audit year when a facility failed its Reserve Capacity test as per clause 4.25.2(a)(ii); but passed under Section 1.8.6 of the Market Procedure. In this case, AEMO correctly	Closed – appropriate actions have been implemented.

Ref	Issue Type & Obligation	Risk & Compliance Ratings	Finding	Recommendation
			deemed that the facility had failed the test, as Section 1.2(b) of the Market Procedure states, "to the extent that this Procedure is contrary or inconsistent with the Market Rules, the Market Rules shall prevail to the extent of the inconsistency". We recommended that the Market Procedure be updated for consistency with the WEM rules and (b) clause 4.25.2(a)(ii). The Market Procedure has been updated and published and is now consistent with the rules. This finding can be closed.	
20WEM1.05	**Issue Type** RBP reported area for improvement **Obligation** 4.26, 4.28, CDA Market Procedure Section 3.2.3	**Risk Rating** Low **Compliance Rating** 3	Opportunity to improve audit trails in CDA process for DSPs Section 3.2.3(a) of the Consumption Deviation Applications Procedure, requires AEMO to conduct the following checks when processing an application submitted under clause 4.26.2CB: (a) comparing the level of consumption in the nominated Trading Interval(s) to the level of consumption: (i) immediately prior to, and after the specified event(s) and/or similar events; (ii) in the equivalent Trading Interval(s) on adjacent days; (iii) in the equivalent Trading Interval(s) on the same weekday in adjacent weeks and/or months; and (iv) in the equivalent Trading Interval(s) on days of similar temperature and/or weather. As part of our audit activities, we reviewed AEMO's process for processing CDA applications for Demand Side Programmes. We sampled applications from two DSPs to check whether AEMO conducted the checks above but were unable to find evidence. AEMO has advised us that these checks were performed as	Closed – appropriate actions have been implemented.

Ref	Issue Type & Obligation	Risk & Compliance Ratings	Finding	Recommendation
			follows: 3.2.3(a)(i) - Trading intervals on either side of the proposed CDA intervals were considered by visually reviewing the data. CDA intervals were often consequential, therefore intervals at the beginnings/ends of runs of maintenance were also considered. 3.2.3(a)(ii) - Equivalent Trading Intervals (s) on adjacent days were considered by graphing the meter data and looking for any deviations and visually examining the data. 3.2.3(a)(iii) - Equivalent Trading Intervals (s) on the same weekday in adjacent weeks were considered by graphing the meter data and looking for any deviations. The local copy was not saved. 3.2.3(a)(iv) - AEMO considered Trading Intervals enveloping the CDA intervals and those within the same month to be intervals with similar temperatures/weather conditions. Data was graphed so any deviations/patterns would become apparent. The local copy was not saved. We accept AEMO's verbal assertion and note that the above checks were acceptable. However, we note opportunity for improving the audit trail of the CDA process so that AEMO's basis for accepting an application (via the checks required under Section 3.2.3(a)) is clearer. The relevant internal procedure document (Relevant Demand Interval Determination and CDA v.7.0) has been updated to clearly specify the above checks, and the corresponding work instructions in Confluence have been updated.	

Ref	Issue Type & Obligation	Risk & Compliance Ratings	Finding	Recommendation
21WEM1.66	**Issue Type** AEMO reported non-compliance **Obligation** 4.1.24	**Risk Rating** Low **Compliance Rating** 1	Failure to publish Individual Reserve Capacity Requirement by the deadline Background: AEMO Failure to publish Individual Reserve Capacity Requirement (IRCR) by the deadline. The WEM Rules require that AEMO determine and publish the Individual Reserve Capacity Requirement (RCR) by 17:00 on the Business Day that is five Business Days prior to the Interval Meter Deadline for the relevant Trading Month. For Trading Month June 2020, this deadline was at 17:00, Monday 27 July 2020. The IRCR was published two minutes late at 17:02 on Monday 27 July 2020. Cause: Human Error. The analyst processing the IRCR mistakenly thought the report had been published, however, it was still in draft. Because of this, initial system alerts were dismissed by the analyst. Impact: Immaterial. The IRCR was published two minutes late. There were no material impacts as a result of this.	Closed – no further actions required.
21WEM1.67	**Issue Type** AEMO reported non-compliance **Obligation** 4.1.12(b), 4.9.8(a), 4.9.9(a)	**Risk Rating** Low **Compliance Rating** 1	Incorrectly determined amount of Certified Reserve Capacity assigned to three Facilities. Summary: A lower amount of Certified Reserve Capacity (CRC) assigned to three Facilities. Background: In accordance with clauses 4.1.12(b), 4.9.8(a) and 4.9.9(a) of the Wholesale Electricity Market Rules (WEM Rules), AEMO assigned Certified Reserve Capacity (CRC) to 72 Facilities for the 2020 Reserve Capacity Cycle on 19 October 2020.	Closed – no further actions required.

Ref	Issue Type & Obligation	Risk & Compliance Ratings	Finding	Recommendation
			It was later identified that AEMO's reasonable expectation of the Facility's capacity for the 2022-23 Capacity Year was incorrectly determined for three Facilities: NEWGEN_KWINANA_CCG1, ALINTA_PNJ_U1 and ALINTA_PNJ_U2. This error occurred as step 5.1.5 of the Market Procedure: Certification of Reserve Capacity, which considers the maximum output from the Facility over the previous 12 month period, was used to determine the amount of assigned CRC for these 3 Facilities rather than step 5.1.4 which considers the expected output from the Facility at 41°C as determined by the temperature dependence curve which has been supplied by an Independent Expert and updated since the previous Reserve Capacity Cycle. The error was articulated to the Market Participants affected and quickly corrected in accordance with the WEM rules. AEMO's Certification internal procedure has been updated to specify the correct method of assessment of capacity.	
21WEM1.22	**Issue Type** AEMO reported non-compliance **Obligation** 1.45.10	**Risk Rating** Low **Compliance Rating** 1	Conscious Breach: New rule clause not implemented by commencement date. At 10:01 on 27 January 2021, AEMO received an email from the Energy Transformation Implementation Unit (ETIU) stating that the Minister for Energy had signed off a gazette which was to be published on 29 January 2021, with a list of clauses to commence on 01 January 2021. AEMO reviewed the document and identified that clause 1.45.10 had been included in the gazette to commence at 08:00 on 01 February 2021. This clause, as identified above was not in the list of clauses that AEMO discussed with ETIU numerous times and AEMO were	Create the required WEM Procedure.

Ref	Issue Type & Obligation	Risk & Compliance Ratings	Finding	Recommendation
			unaware that this clause was to commence on 01 February 2021. At 09:48 on 28 January, AEMO raised the issue with ETIU where it was identified that the inclusion of clause 1.45.10 was an error, however, nothing could be done as it had already been signed off by the Minister for Energy. At 08:00 on 01 February 2021, the abovementioned clause commenced and AEMO were required to have developed a WEM Procedure under clause 1.45.10 and to comply with this WEM Procedure from 08:00 on 01 February 2021. AEMO has not commenced the creation of the abovementioned WEM Procedure as required under clause 1.45.10, as AEMO were of the understanding that the WEM Procedure would not require commencement until July 2021, when other various Reserve Capacity WEM Procedures are required to commence.	
21WEM1.35	**Issue Type** AEMO reported non-compliance **Obligation** Appendix 5	**Risk Rating** Medium **Compliance Rating** 1	Incorrect loss factors applied to Notional Wholesale Meter for IRCR calculation The calculation of the Individual Reserve Capacity Requirement is defined in Appendix 5 of the WEM rules. This process includes the calculation of the Sent Out Metered Schedule for the Notional Wholesale Meter (NWM), which requires the application of a Transmission Loss factor (TLF) and Distribution Loss Factor (DLF) for the NWM. AEMO's procedure for the updating of loss factors is that the approved factors from Western Power, including factors for the NWM, are entered into WEMS. Loss factors for all meters other than the NWM are obtained automatically by POMAX from WEM without manual intervention. Loss factors for the NWM however, are separate manually configured values, not obtained from WEMS. AEMO's internal procedures do not document that manual updating of the loss factors for the NWM. Consequently, AEMO (and previously the IMO) have neglected to update the NWM loss factors from 2011 onwards.	- To the extent possible, correct the settlement outcomes - Implement system changes so that the NWM loss factors are updated automatically, rather than entered manually

Ref	Issue Type & Obligation	Risk & Compliance Ratings	Finding	Recommendation
			AEMO are implementing system changes that will "permanently associate the required loss factor codes with the Notional Wholesale Meter, eliminating the need for a separate manual process related to the Notional Wholesale Meter". This is expected to go into production on 28 July 2021.	
21WEM1.52	**Issue Type** RBP reported non-compliance **Obligation** 4.26.2CA, Appendix 10	**Risk Rating** Low **Compliance Rating** 1	Failure to recalculate Relevant Demand flowing a Consumption Deviation Application resulting in incorrect NSTEM Settlement calculations. The WEM Rules define a quantity called the Relevant Demand (RD) for a Demand Side Programme (DSP). The calculation of RD is defined for each trading day d for each DSP by clause 4.26.2CA and Appendix 10 of the WEM rules. Appendix 10 of the WEM Rules contains the statement "The Relevant Demand value is to be re-calculated for each Demand Side Programme for each Trading Day" (2nd paragraph of Appendix 10). This places an obligation on AEMO to recalculate the value, but it does not specify when this recalculation should occur. While The Appendix 10 calculation is based on historical data (from the previous capacity year), the time of the re-calculation can result in different RD results, particularly if a Consumption Deviation Application (CDA) has been approved for a DSP. There is a special provision in the Appendix 10 calculations (step 2(c)) whereby if a CDA has been approved for a DSP's Associated Load, then the load value to be used in the RD calculations is AEMO's estimate of what the consumption of the Associated Load would have been if it had not been affected (AEMO determines this estimate as part of the CDA approval process). Therefore, the recalculated RD value for a trading day could be significantly different depending on whether the recalculation occurs before or after a CDA is approved. The deadline for submitting CDAs is October 31 following the end of the capacity year, and AEMO have up to 10 business days to approve or reject the CDA application (e.g., up to 13 November 2020 for the 2019-20 Capacity	Implement the proposed solution.

Ref	Issue Type & Obligation	Risk & Compliance Ratings	Finding	Recommendation
			Year). So, there is a period of time following the end of a capacity year in which the CDA approval status for the capacity year could change, affecting the RD calculation. AEMO's current implementation is to calculate the RD for each DSP for each trading day d once only on trading day d-1. The RD values are never re-calculated once they have been calculated for a trading day. Non-STEM settlements are calculated over a whole Trading Month and incorporate RD values for each Trading Day in the Trading Month. Because CDA applications for the preceding capacity year can still be approved throughout the month of October and part of November following that trading year, the RD values are subject to change during that time period. Therefore, with AEMO's current implementation, Non-STEM Settlement calculations for the Trading Months of October and November can take in RD values that do not take into account approved CDAs. For example, a DSP could incur a FRCDR charge (for some periods of the Trading Month) for reduction in consumption that is in fact covered by an approved CDA. It is clear that the purpose of the CDA process and step 2(c) of Appendix 10 is that variations in consumption with certain causes (AEMO direction AND maintenance events) should not affect these Non-STEM Settlement calculations; AEMO's estimate of consumption should be used instead. AEMO's current implementation is therefore incorrect: At the time of performing Non-STEM Settlement, the RD value for all Trading Days in the Trading Month should be re-calculated, taking into account all approved CDAs. AEMO's proposed solution is as follows: a) For all purposes other than settlement, maintain the current implementation (i.e. calculating RD values for Trading day d once only on Trading Day d-1) b) For Non-STEM Settlement, RD values are to be re-calculated whenever they are required (i.e. at the time of performing the settlement calculations) We agree that this solution addresses the key issue as identified above.	

Ref	Issue Type & Obligation	Risk & Compliance Ratings	Finding	Recommendation
21WEM1.72	**Issue Type** AEMO reported non-compliance **Obligation** Appendix 9	**Risk Rating** Low **Compliance Rating** 1	Failure to publish EFLSG forecast by required date Step 19 of Appendix 9 of the WEM Rules requires AEMO to publish the forecast of the Existing Facility Load for Scheduled Generation (EFLSG) as determined by step 7 by 1 June of year 1 of each Reserve Capacity Cycle. For the 2021 cycle, AEMO missed this deadline, publishing the EFLSG forecast on 15 June 2021. The delay was caused by human error. This had no impact on Market Participants given the CRC window has been pushed back to 1 December. The requirement to publish this information is cease once rule change RC_2019_03 commences.	Implement a systematic reminder to ensure that the deadline is not missed for future Reserve Capacity Cycles.
21WEM1.73	**Issue Type** AEMO reported non-compliance **Obligation** Appendix 9	**Risk Rating** Medium **Compliance Rating** 1	Incorrect Relevant Level Calculation Appendix 9 specified the calculation of the Relevant Level (RL) for Facilities in each Reserve Capacity Cycle. Due to a misinterpretation of the deviation estimates, which are an input to the RL calculation, RL values have been calculated incorrectly for the Reserve Capacity Cycle 2017-2020. The error is caused by the misinterpretation of the deviation estimates as curtailed values rather than maximum sent out values when they were entered into the RL Tool. We note that a new RL tool was developed in early 2017, and AEMO received a certification of the RL Tool on 10 May 2017, however step 4 of Appendix 9 is specifically excluded from the certification. The error has resulted in incorrect Capacity Payments for individual market participants, with a total financial impact of $142,805.80. AEMO have recalculated the corrected RL, CRC, Capacity Credits, Reserve Capacity Price and Reserve Capacity Payment values, and informed Market Participants of the situation and recalculated values. AEMO have decided, based on a risk assessment, not to revise RL, CRC and CC values.	Update the RL tool so that the RL values are correctly calculated given the available deviation estimate values.

8 WEM Rules Chapter 5 – Network Control Services

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

8.1 Rule amendment

There have been minor cosmetic amendments to Chapter 5 of the WEM Rules as part of WEM reform. However, none of these amendments impact on the interpretation and application of Chapter 5.

8.2 AEMO Procedures

AEMO's Internal Procedures are compliant with Chapter 5 of the WEM Rules in all material respects.

8.3 Operational compliance with Chapter 5

8.3.1 Audit activities

We have reviewed AEMO's process for dispatching GIA generators using the NCS process.

AEMO has made improvements to the GIA dispatch process since the previous audit (see 20WEM1.45, Section 4) to enhance the visibility of GIA facility impacts on the power system.

Improvements made include:

- An ability for AEMO controllers to take control of dispatch of GIA facilities where curtailment may cause adverse power system impacts.
- Changes to the dispatch process to enable AEMO controllers to detect potential adverse interactions between GIA and Ancillary Services dispatch and intervene accordingly.

8.3.2 Audit findings

There have been no instances of self-reported non-compliance with Chapter 5, and we have noted no audit findings.

9 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.

9.1 Rule amendments

Changes to Chapter 6 are summarised below.

Rule change	Nature of changes
RC_2019_04: Administrative Improvements to Settlement	Removal of clause preventing recalculation of Theoretical Energy Schedule for adjustments relating to disagreements and disputes
RC_2019_05: Amending the Minimum STEM Price definition and determination	Transition of Minimum STEM Price review to ERA

9.2 AEMO procedures

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

9.3 Operational compliance with Chapter 6

9.3.1 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 reviewed:

- Self-reported instances of non-compliance with Chapter 6

- AEMO's calculation of the Alternative Maximum STEM Price (AMSP)

9.3.2 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
21WEM1.60	**Issue Type** AEMO reported non-compliance **Obligation** 6.16.2, 9.7.1A.	**Risk Rating** Low **Compliance Rating** 1	Incorrect Capacity Cost Refund charges calculated due to system fault WEM Rule clause 6.16.2 requires AEMO to calculate the Demand Side Programme Load (DSPL) as a positive value. Because raw meter data for loads is negative, RCM settlements was developed to multiply DSPL values by -1 before they were used. However, the Pomax Settlements system had already converted the negative values to positive values before being imported into RCM Settlements, making the use of the -1 factor incorrect. The result was an inflated Refund Factor value being used, resulting in higher Capacity Cost Refund charges being incurred by participants. The impact on participants totalled approximately AUD 400,000 in total since 1 October 2017. AEMO have implemented an update of the RCM Settlements software to remove the incorrect -1 factor. AEMO have also published Settlement Adjustments for April 2019 - January 2020 to reverse the incorrectly calculated CCRs to the maximum extent possible.	Closed - the appropriate actions have been implemented.
21WEM1.65	**Issue Type** AEMO reported non-compliance **Obligation** 6.16A.1(b)i,	**Risk Rating** Low **Compliance Rating** 1	Failure to set Out of Merit Generation to zero for NSTEM Adjustment Statements. AEMO failed to set Out of Merit Generation to zero for the January 2020 NSTEM Adjustment 1 Statements, after receiving notice from the ERA that a participant had not adequately or appropriately complied with a Dispatch Order.	Closed – no further actions required.

Ref	Issue Type & Obligation	Risk & Compliance Ratings	Finding	Recommendation
	6.16A.2(b)i, 6.16B.1(b)i, 6.16B.2(b)i		The breach was caused by human error. The email from the ERA was not processed on time in accordance with the associated work instruction and was filed in an incorrect archive folder. The settlement impact was immaterial; initial impacts are to two Market Participants with a combined total of $772. This will be corrected as part of the settlement adjustment process.	
21WEM1.49	**Issue Type** RBP reported non-compliance **Obligation** 6.20.3; 6.20.11	**Risk Rating** Low **Compliance Rating** 1	Errors in calculation of Alternative Maximum STEM Price since September 2020 Since the 2020 Energy Price Limits Review, the ERA-approved formula for the Alternative Maximum STEM Price (AMSP) is: $145.28/MWh + 19.808 multiplied by the net ex-terminal distillate fuel cost in $/GJ In the ERA decision, the net ex-terminal distillate fuel cost is further defined: "Net ex-terminal price represents the wholesale price for distillate in Perth, Western Australia after deduction of fuel excise rebate and excluding GST. This price does not include road freight costs" (Footnote 1, page 1). We have examined the Excel workbooks that AEMO has used to calculate the monthly AMSP values. In these workbooks, the above formula is not implemented directly, but instead the following process is followed: 1. For the month of July 2020, the fuel component of the above formula (19.808 x distillate price) is calculated using a distillate price of 12.02 $/GJ. This distillate price is from Table 11 in the Final Report prepared by Marsden Jacobs for AEMO as part of the 2020 Energy Price Limits Review. 2. For July 2020, and each subsequent month, a 3-month average distillate price is calculated, being the average of the daily Perth Terminal Gate Price (TGP) for the 2nd, 3rd and 4th calendar months preceding the current month. 3. For each subsequent month after July 2020, the fuel component value from step 1	Determine an appropriate net ex-terminal distillate fuel cost that addresses the identified issues and use this for the purposes of the calculation of the AMSP for future Trading Months.

Ref	Issue Type & Obligation	Risk & Compliance Ratings	Finding	Recommendation
			is multiplied by an index value, being the 3-month average distillate price for the current month divided by the 3-month average distillate price for July 2020 4. The fuel component from step 3 is added to the constant non-fuel component ($143.28/MWh) to obtain the AMSP value for each month. The values that have been calculated in this manner have been applied since September 2020. The issues we see with this process relate to a disconnect between the 12.02 $/GJ used for the July 2020 fuel component value, and the 3-month average price used to scale this component for subsequent months: 1. It is not specified in the Marsden Jacobs report that the 12.02 $/GJ price applies specifically to July 2020. The value is used in the Marsden Jacobs report to set a gas price ceiling for the calculation of the Maximum STEM Price, and a basis for comparing prices resulting from the 2020 review to those from the 2019 review. AEMO have provided an email from Marsden Jacobs regarding this price, but it does not provide satisfactory evidence that this is a suitable price to use for July 2020. 2. Neither the 3-month average methodology, nor a simple average of July 2020 TGP prices reproduce the 12.02 $/GJ value 3. The Marsden Jacobs report does specify that the 12.02 $/GJ value is inclusive of transport to Pinjar, whereas the ERA decision makes it clear that the fuel price to be used is exclusive of transport costs. The net result of these factors is that the AMSP values that have been calculated and published by AEMO are lower than the values that would be calculated by a straightforward calculation of the formula in the ERA decision (using the 3-month average TGP price as the distillate price) by an average of 5.2% Note that the calculation spreadsheet was certified in July 2016. The above findings relate to the data that has been entered into the spreadsheet, not an error in the	

Ref	Issue Type & Obligation	Risk & Compliance Ratings	Finding	Recommendation
			spreadsheet itself. The 12.02 $/GJ value in question is entered into a worksheet that was not present at the time of the certification, so is not covered by the certification.	

10 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.

10.1 Rule amendments

Changes to Chapter 7 are summarised below.

Rule change	Nature of changes
RC_2020_03	Incorporation of GIA Facilities under Operating Instructions in Relevant Level Methodology

10.2 AEMO procedures

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

10.3 Operational compliance with Chapter 7

10.3.1 Audit activities

We have reviewed:

- Self-reported instances of non-compliance with Chapter 7
- AEMO's approach to power system controller training, fatigue management and quality assurance as controls to meet their power system security reliability obligations under Chapter 3, and dispatch obligations under Chapter 7. We have also reviewed rosters to audit whether Fatigue Management Guidelines are being followed.
- AEMO's approach to dispatching marginal intermittent generators.
- AEMO's calculation of Equivalent Planned Outage Hours (EPOH)

10.3.2 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
20WEM1.39	**Issue Type** RBP reported non-compliance **Obligation** 7.11.5(i)	**Risk Rating** Low **Compliance Rating** 1	Failure to issue Dispatch Advisory for Emergency Operating State According to control room logs, the system was placed in Emergency Operating State (EOS) at 8:08PM on 10/01/2020, due to a trip of a Facility and resulting drop in system frequency. The state was subsequently downgraded to High-Risk Operating State (HROS) once the frequency was restored to above 49.3 Hz. According to the list of issued Dispatch Advisories (DA) we received, a DA was issued at 8:48PM for the HROS, but no DA was issued for the EOS. According to WEM rule clause 7.11.5(i), System Management must release a DA in the event of being in an EOS. We expect that the reason that no DA was issued for the EOS was that by the time the DA was issued, some 40 minutes had passed and the system was no longer in EOS. Clause 7.11.3A allows System Management to issue a DA after the event has occurred, so given the delay, the correct action in this case would have been to issue the DA for the EOS followed by the DA for the HROS. This is important for market transparency so that all market participants are aware that the EOS occurred.	Closed - AEMO has reinforced its Dispatch Advisory Guidelines, and circulated a Dispatch Advisory "cheat sheet" as a resource to assist controllers identify triggers for Dispatch Advisory issuance

Ref	Issue Type & Obligation	Risk & Compliance Ratings	Finding	Recommendation
20WEM1.41	**Issue Type** RBP reported non-compliance **Obligation** 7.7.11	**Risk Rating** Low **Compliance Rating** 1	Constraints due to network outages with no OI issued as per rule change RC_2018_07 According to the new rule clause 7.7.11, introduced under RC_2018_07, if a facility is constrained down due to a network outage, then a retrospective OI must be issued, which will prevent the facility from receiving a constrained off payment for the event. From reviewing a sample of control room logs, we have identified a number of constraints that have been applied due to network outages, that do not have a corresponding OI in the list of OIs that has been provided to us. These would be breaches of the new rules: Date Time BSI Event Type Event Description 27/01/2020 1:48:00 AM WWF Constraint-Network Applied to 0MW due to trip of MGA-GTN81 to maintain Power System Security. DA# 206627 issued. 27/01/2020 2:41:00 AM WWF Constraint-Network Applied to 0MW due to trip of MGA-GTN81 again. DA# 206628 issued. Upon further investigation, it was found that the facility received no constrained off payment, but this was due to another error by the AEMO team, in that they erroneously considered the outage to be a Consequential outage.	Closed - multiple workshops have been held within System Management to facilitate the correct interpretation and operationalisation of clause 7.7.11. A Network Equipment Outage Work Instruction has also been developed and socialised which provides guidance around what triggers clause 7.7.11. to be applied with respect to network equipment outages.
20WEM1.42	**Issue Type** RBP reported non-compliance	**Risk Rating** Medium **Compliance**	Constraints due to network outages with OIs issued as per rule change RC_2018_07 with no audit trail in control room logs. According to RC_2018_07, if a facility is constrained down due to a network outage, then a retrospective OI must be issued, which will prevent the	Closed - multiple workshops have been held within System Management to facilitate the correct interpretation and

Ref	Issue Type & Obligation	Risk & Compliance Ratings	Finding	Recommendation
	Obligation 7.7.11	**Rating** 1	facility from receiving a constrained off payment for the event. From a review of OIs that have been issued, cross-referenced against control room logs, we have identified a number of instances in which OIs have been issued for events that do not have any mention in the control room logs. Because these OIs will have a financial impact via the participants' settlements, it is important that there is an audit trail that provides details of the circumstances behind the OIs. Examples of this issue include OIs issued on 21/11/2019 and 11/3/2020. AEMO have investigated these instances, and have found that in these cases, the OIs should not have been issued, as the circumstances did not justify the issuing of OIs under WEM rule 7.7.11. This is therefore a breach, with an impact on the Participants' settlements.	operationalisation of clause 7.7.11. A Network Equipment Outage Work Instruction has also been developed and socialised which provides guidance around what triggers clause 7.7.11. to be applied with respect to network equipment outages. AEMO has confirmed there was no settlement impact associated with this breach.
21WEM1.61	**Issue Type** AEMO reported non-compliance **Obligation** 7.11.4	**Risk Rating** Low **Compliance Rating** 1	Failure to withdraw Dispatch Advisory when situation was resolved Breach occurred in previous audit period. On 10/03/2020 at 13:50, a Dispatch Advisory, with a Normal Operating State was issued in relation to a planned Western Power Networks outage requiring constraints to be placed on two facilities. At 13:52, Western Power contacted the Control Room to advise that the outage had been restored and the constraints on the two facilities could be removed. The constraints were removed, but the DA was not withdrawn. The Dispatch Advisory was not withdrawn until 12/03/2020 at 05:40. The breach was caused by oversight. AEMO reiterated to control room operators to ensure active Dispatch Advisories are handed over during shift handover and reviewed the Dispatch Advisory process pertaining to outages that occur over multiple days with return to service occurring	Closed - AEMO has reinforced its Dispatch Advisory Guidelines, and circulated a Dispatch Advisory "cheat sheet" as a resource to assist controllers identify triggers for Dispatch Advisory issuance

Ref	Issue Type & Obligation	Risk & Compliance Ratings	Finding	Recommendation
			overnight.	
21WEM1.02	**Issue Type** AEMO reported non-compliance **Obligation** 7.7.11	**Risk Rating** Low **Compliance Rating** 1	Failure to issue retrospective DI Clause 7.7.11 requires AEMO to issue a retrospective Operating Instruction to a Balancing Facility that has been curtailed as a result of network outage; such a Facility is not eligible to receive a constrained-off payment. On 27 January 2020, System Management did not issue and record retrospective Operating Instructions to a Balancing Facility that was curtailed following the trip of a transmission line. AEMO has noted that as a result of the breach incorrect values were passed to settlement; however, there was no financial impact. AEMO has advised that multiple workshops have subsequently been held within System Management to facilitate the interpretation of and operationalise clause 7.7.11 correctly. A Network Equipment Outage Work Instruction has also been developed and socialised which provides guidance around what triggers clause 7.7.11. to be applied with respect to network equipment outages.	Closed - multiple workshops have been held within System Management to facilitate the correct interpretation and operationalisation of clause 7.7.11. A Network Equipment Outage Work Instruction has also been developed and socialised which provides guidance around what triggers clause 7.7.11. to be applied with respect to network equipment outages.
21WEM1.04	**Issue Type** AEMO reported non-compliance **Obligation** 7.11.5(g)	**Risk Rating** Low **Compliance Rating** 1	Failure to issue Dispatch Advisory System Management did not issue a Dispatch Advisory for Out of Merit Generation after a facility was Constrained for a Network Maintenance Outage. The root cause was human error; issues with the initial application of the relevant constraints and the attempts to resolve the issue led to an oversight on the part of the controllers who failed to inform Dispatch Advisory issuing team (System Management - Operations) of the need to	Closed - AEMO has reinforced its Dispatch Advisory Guidelines, and communication between all teams where Network equipment outages are involved.

Ref	Issue Type & Obligation	Risk & Compliance Ratings	Finding	Recommendation
			issue a Dispatch Advisory. AEMO has advised that they have reinforced knowledge of Dispatch Advisory Guidelines by refresher communication to the Power System Controllers, and reinforced the communication between all teams where Network equipment outages are involved.	AEMO has circulated a Dispatch Advisory "cheat sheet" as a resource to assist controllers identify triggers for Dispatch Advisory issuance
21WEM1.10	**Issue Type** AEMO reported non-compliance **Obligation** 7.11.5(g)	**Risk Rating** Low **Compliance Rating** 1	Failure to issue Dispatch Advisory System Management did not issue a Dispatch Advisory for potential Out of Merit Generation after a facility was Constrained for Security Reasons. The socialisation of a DA cheat sheet to control room staff should remediate breaches of this nature in the future.	Closed - AEMO has reinforced its Dispatch Advisory Guidelines, and circulated a Dispatch Advisory "cheat sheet" as a resource to assist controllers identify triggers for Dispatch Advisory issuance
21WEM1.12	**Issue Type** AEMO reported non-compliance **Obligation** 7.6.1C(a)	**Risk Rating** Low **Compliance Rating** 1	Incorrect out of merit dispatch On 6 December 2020, AEMO incorrectly constrained down a facility incorrectly, thereby dispatching it out of merit. The facility was marginal at the time, and as a result of not being under Automatic Balancing Control (ABC), its response was not immediately obvious to AEMO (as the facility responds manually to Dispatch Instructions and must acknowledge that it is following the instruction; in this instance the facility did not acknowledge the Dispatch Instruction). Controllers were unable to contact facility operations and based on a history of repeated dispatch non-compliance by the facility decided to constrain the facility down to zero. As a result of the breach, the facility received $32,920 in constrained-off payments.	No further actions required; existing controls mitigate risk appropriately

Ref	Issue Type & Obligation	Risk & Compliance Ratings	Finding	Recommendation
			AEMO relies on manual acknowledgement from non-ABC facilities to ascertain dispatch compliance. There are two such facilities currently operating in the WEM. AEMO has advised that in the event these facilities do not acknowledge Dispatch Instructions, the standard procedure is to contact the relevant facility. If controllers cannot contact the facility, then AEMO constrains the Facility to err on the side of caution. While this may result in out-of-merit dispatch, we agree that this is the most prudent approach to ensure power system security.	
21WEM1.13	**Issue Type** AEMO reported non-compliance **Obligation** 7.11.5(g)	**Risk Rating** Low **Compliance Rating** 1	Failure to issue Dispatch Advisory On 6 December 2020, AEMO did not issue a Dispatch Advisory for possible Out of Merit Generation after a facility was Constrained for Dispatch reasons. The root cause was human error; the relevant controller applied the constraint for security reasons, as a result of incorrectly believing that the relevant facility was not responding to Dispatch Instructions (see also #647). The controller subsequently failed to issue the Dispatch Advisory themselves, and also failed to notify the SM Operations team to issue an advisory.	Closed - AEMO has reinforced its Dispatch Advisory Guidelines, and circulated a Dispatch Advisory "cheat sheet" as a resource to assist controllers identify triggers for Dispatch Advisory issuance
21WEM1.14	**Issue Type** AEMO reported non-compliance **Obligation** 7.6.1C(a)	**Risk Rating** Low **Compliance Rating** 1	Incorrect out of merit dispatch On 21 November 2020, AEMO incorrectly dispatched a facility out of merit. The facility operator contacted AEMO and advised that they had been cleared for a lower quantity (10MW) than what their Balancing Submission indicated they should be cleared for (15MW). AEMO constrained on the facility to reflect the facility operator's expectation of what its cleared value	We recommend that AEMO document and socialise with controllers a process that sets out actions to take when a participant contacts the control room advising issues with their Dispatch

Ref	Issue Type & Obligation	Risk & Compliance Ratings	Finding	Recommendation
			should have been, and later constrained it to zero when it became marginal. The controller was incorrect in their actions, as the facility had actually been cleared for 10MW in the Balancing Merit Order and should have been dispatched as such.	Instructions. In particular, AEMO should emphasise to controllers that they should not be taking advice from participants on what their dispatch targets should be.
21WEM1.19	**Issue Type** AEMO reported non-compliance **Obligation** 7.11.5(g)	**Risk Rating** Low **Compliance Rating** 1	Failure to issue Dispatch Advisory On 14 January 2021, AEMO did not issue a Dispatch Advisory for possible Out of Merit Generation after a facility was incorrectly constrained down for security reasons (see breach 654). The root cause was oversight as a result of human error.	Closed - AEMO has reinforced its Dispatch Advisory Guidelines, and circulated a Dispatch Advisory "cheat sheet" as a resource to assist controllers identify triggers for Dispatch Advisory issuance
21WEM1.20	**Issue Type** AEMO reported non-compliance **Obligation** 7.3.4, 3.21.6(b), 4.12.6(c)	**Risk Rating** Low **Compliance Rating** 1	Failure to zero out outages for Facilities undergoing Commissioning Tests Clause 3.12.6(b) requires AEMO to calculate ex-ante and ex-post outages for a Facility for each Trading Interval as the capacity adjusted outage quantity. AEMO's process zeroes out outages for Facilities that were subject to approved Commissioning Test Plans (so that such Facilities would not incorrectly pay Reserve Capacity refund, as such Facilities have their Reserve Capacity Obligation Quantities (RCOQ) reduced to zero under clause 4.12.6(c)). The zeroing process involved running a check to see whether there were any Dispatch Volumes for Commissioning Tests that coincided with an outage - the relevant outages are then zeroed out. In May 2020, the zeroing process failed as a result of the Dispatch Volume file not being populated as a result of human error. However, this error had no settlement	Closed - no further actions required.

Ref	Issue Type & Obligation	Risk & Compliance Ratings	Finding	Recommendation
			impact, as the failure pertained to the ex-ante outage file that was not used for settlement. Note that RC_2014_03 which commenced on 29 June 2021, which means the zeroing of outages is no longer required.	
21WEM1.21	**Issue Type** AEMO reported non-compliance **Obligation** 7.3.4, 7.13.1A(b) 4.12.6(b)	**Risk Rating** Low **Compliance Rating** 1	Opportunistic Maintenance outages excluded from schedule of Outages used for Settlement Clauses 7.3.4 and 7.13.1A(b) requires AEMO to prepare and record and a schedule of all Planned Outages by Market Participant and Registered Facility for each Trading Interval of each Trading Day. This is subsequently used in settlement to reduce the Reserve Capacity Obligation Quantity (RCOQ) of a Market Participant in respect of its Facility (clause 4.12.6(b)), for the purposes of determining Reserve Capacity refunds. The new SMST system aggregates Day Ahead Opportunistic Maintenance (DAO) and On the Day Opportunistic Maintenance (ODOM) outages under a single Opportunistic Maintenance (OPP) flag. The event-generation processes (Ex-Ante & Ex-Post Outage quantity calculations) were not updated during go-live to include the 'OPP' flags in the Planned Outage quantity aggregation. As a result, the schedule of outages required under clauses 7.3.4 and 7.13.1A(b) would have excluded Opportunistic Maintenance outages. This would have consequently impacted on the calculation of Reserve Capacity refund quantities, over-estimating the refunds for Market Participants with Facilities on Opportunistic Maintenance outages. This breach affected 21 Trading Days between November 2020 and February 2021. The error was discovered and corrected on 4 February 2021,	Closed - no further actions required. This breach had no settlement impact, and AEMO has resolved the underlying issue via a system fix.

Ref	Issue Type & Obligation	Risk & Compliance Ratings	Finding	Recommendation
			with a corrected file of historical outages incorporated for settlement purposes.	
21WEM1.23	**Issue Type** AEMO reported non-compliance **Obligation** 7.11.3, 7.11.5(g)	**Risk Rating** Low **Compliance Rating** 1	Failure to issue Dispatch Advisory for Out of Merit dispatch AEMO did not issue a Dispatch Advisory for possible Out of Merit Generation after a facility was constrained down for security reasons. The root cause was oversight as a result of human error.	Closed - AEMO has reinforced its Dispatch Advisory Guidelines, and circulated a Dispatch Advisory "cheat sheet" as a resource to assist controllers identify triggers for Dispatch Advisory issuance
21WEM1.24	**Issue Type** AEMO reported non-compliance **Obligation** 7.6.1C	**Risk Rating** Low **Compliance Rating** 1	Incorrect Out of Merit dispatch due to IT systems failure Due to an IT system failure, the latest BMO files did not load to the Real-Time Dispatch Engine causing out of merit dispatch. Dispatch Out of Merit due to the IT failure experienced yesterday evening causing BMO files to fail to load into the Real-Time Dispatch Engine for Trading Interval 20-1 on 24 February 2021. The breach affected only one facility, and AEMO has advised there was no financial impact.	Closed - no further action required
21WEM1.33	**Issue Type** AEMO reported non-compliance **Obligation** 7.11.5(h)	**Risk Rating** Low **Compliance Rating** 1	Failure to issue Dispatch Advisory to notify use of Back-up LFAS AEMO must issue a Dispatch Advisory when it expects to use LFAS Facilities, other than in accordance with the LFAS Enablement Schedules in clause 7B.3.8. On 13 March 2021, AEMO failed to issue a Dispatch Advisory as a result of an oversight when it activated Back Up LFAS from as a result of an LFAS provider being out of service.	Closed - AEMO has reinforced its Dispatch Advisory Guidelines, and circulated a Dispatch Advisory "cheat sheet" as a resource to assist controllers identify triggers for Dispatch Advisory issuance

Ref	Issue Type & Obligation	Risk & Compliance Ratings	Finding	Recommendation
21WEM1.45	**Issue Type** RBP reported non-compliance **Obligation** 7.11.5(h)	**Risk Rating** Low **Compliance Rating** 1	Failure to issue Dispatch Advisory AEMO must issue a Dispatch Advisory when it expects to use LFAS Facilities, other than in accordance with the LFAS Enablement Schedules in clause 7B.3.8. On 18 July 2020 (Trading Interval 06:30 - 08:00) and 19 July 2020 (Trading Intervals 09:00-14:00), AEMO enabled back-up LFAS to respectively address a provider being unavailable and NSG volatility. However, Dispatch Advisories were not issued in accordance with clause 7.11.5(h).	Closed - AEMO has reinforced its Dispatch Advisory Guidelines, and circulated a Dispatch Advisory "cheat sheet" as a resource to assist controllers identify triggers for Dispatch Advisory issuance
21WEM1.46	**Issue Type** RBP reported compliance risk **Obligation** 7.6.1C	**Risk Rating** Low **Compliance Rating** 2	Approach to dispatching marginal intermittent generators is not formalised The recent increase in new renewable entrants has meant that the prevalence of intermittent generation being marginal has increased. When an intermittent generation is marginal, the Real-Time Dispatch Engine (RTDE) issues a dispatch cap to the relevant generator that caps its output to the quantity required to meet the load (for example, a marginal wind generator cleared for 40MW may generate up to 40MW but no more). RTDE re-dispatches as the load forecast changes. When RTDE redispatches a marginal intermittent generator, depending on the magnitude of the change, the RTDE issued dispatch cap can create power system security issues. For example, if RTDE dispatches up a wind generator from 40MW to 140MW, and conditions are such that the resulting ramp would be instantaneous, then such a dispatch instruction may create frequency deviations that threaten power system security. In such circumstances, to prevent adverse power system impacts System Management applies manual constraints to the relevant intermittent generator to effect RTDE's dispatch in a manner that has a gentler ramp. In doing so, out of merit	We recommend AEMO formalise the out of merit dispatch process for marginal intermittent generators to ensure consistent and correct application by controllers.

Ref	Issue Type & Obligation	Risk & Compliance Ratings	Finding	Recommendation
			dispatch may occur. In such circumstances, AEMO is dispatching in accordance with clause 7.6.1C(b) (dispatch out of merit facilities ahead of in-merit facilities) using clause 7.6.1C(d) (avoidance of high risk or emergency operating state) as rationale for out of merit dispatch. As such, AEMO's dispatch decision is compliant with the WEM Rules. Note that this issue is less problematic when the ramp occurs downwards, as the relevant generator should have the ability to conduct a controlled ramp down. However, if an intermittent generator has a particularly high down-ramp rate, then AEMO may also need to issue manual constraints when RTDE dispatches the generator downwards[13]. The above process is not formalised and appears to have been socialised with controllers verbally. Incorrect application of the process can have adverse power system impacts, and incorrect out of merit dispatch can have financial impacts on Market Participants. A formalised process should (at a minimum but not limited to) include: • A clear description of what would trigger the above manual intervention. • Criteria/framework that enables the controller to determine whether a High Risk or Emergency Operating State would occur without intervention (this may well be inherent in the issue description above)	

[13] We note that the issue of instantaneous ramping will be resolved through WEM reform changes which require generators to ramp linearly to their dispatch targets.

Ref	Issue Type & Obligation	Risk & Compliance Ratings	Finding	Recommendation
			• Guidelines on the type of information that should be recorded in the control room logbook to provide a rationale for the controller's decision (and to facilitate audit). • Updates to the DA Advisory Guidelines/Cheat Sheet to reflect content to be included in resulting Dispatch Advisories.	
21WEM1.48	**Issue Type** RBP reported compliance risk **Obligation** Ch 3, Ch 7	**Risk Rating** Medium **Compliance Rating** 2	No simulator training conducted for controllers on an ongoing basis, and no access to simulator for assessment purposes until new EMS system is implemented Controller training is one of the key controls pertaining to maintaining power system security and reliability and real-time dispatch of energy and ancillary services. Training is a particularly important control in the WEM, given the increasing volatility from rooftop PV, and the lack of procedures/guidelines to underpin consistent decision making. WEM controllers have historically only undergone simulator training as part of their assessment performance (during rank progression). This has been driven by the fact that the only simulator available was owned by Western Power. AEMO's ability to use the simulator has therefore been historically restricted. With the implementation of SMST, and the transition away from shared Western Power systems, AEMO now has no access to a simulator for either training or assessment purposes; the last controller assessment was performed without a simulator. AEMO has advised that a simulator is likely to available by the end of 2021, and that it is unlikely any other controllers will be progressing in rank before then.	We recommend that once AEMO has its own simulator available, regular simulator training be instituted as part of the controller training regime.

Ref	Issue Type & Obligation	Risk & Compliance Ratings	Finding	Recommendation
			The risk associated with this finding is that the absence of simulator training leads to an adverse power system outcome as a result of a controller being unprepared. Given the other training resources in place, and AEMO's current ability to re-dispatch we think the likelihood is unlikely. However, the consequence of manifestation would be moderate to major. As such we deem this risk to be Medium.	
21WEM1.57	**Issue Type** RBP reported compliance risk **Obligation** Ch 3,7	**Risk Rating** Low **Compliance Rating** 2	Control Room quality assurance controls are not being applied regularly System Management's WEM RTO Operations Quality Review Procedure (version 1.0 dated 27 December 2019) sets out various quality control reviews that are supposed to be conducted with varying frequencies: • A review of the AEMO-WP Inter Control Room Communication Protocol is supposed to be conducted at least quarterly reviewing adherence to the Protocol. • A review of the Dispatch Logbook is supposed to be conducted at least quarterly reviewing a sample of logs for adherence to the relevant logbook guidelines. • A review of the Security Logbook is supposed to be conducted at least quarterly reviewing a sample of logs for adherence to the relevant logbook guidelines. • A review of staff rostering to be conducted at least once every six weeks reviewing adherence to Fatigue Management Guidelines • A review of the Issues Register populated by controllers to be conducted at least monthly with a view to reviewing the issues logged, identifying areas for improvement or change and actioning items where relevant.	We recommend that System Management conduct the documented reviews in accordance with the WEM RTO Operations Quality Review Procedure, including ensuring a Near Hits Register is implemented. At the very least, System Management should prioritise the reviews of items such as the Near Hits Register and the rostering process.

Ref	Issue Type & Obligation	Risk & Compliance Ratings	Finding	Recommendation
			• A review of the Near Hits Register populated by controllers to be conducted at least monthly with a view to reviewing the issues logged, identifying areas for improvement or change and actioning items where relevant. The above reviews, if conducted as documented, would be effective in ensuring other controls in place to mitigate power system operating risks are operating as intended, and are amended as required to ensure residual risk is managed at a tolerable limit. However, System Management has not conducted no reviews in the audit period to date . System Management were also unable to provide us with a copy of the Near Hits register; hence we are unable to comment on whether that particular control exists (noting that if it did, and the review (along with a review of the Issues Register) was conducted as documented with actions followed through, it would be a very effective control to mitigating against adverse power system incidents).	
21WEM1.69	**Issue Type** RBP reported area for improvement **Obligation** 7.13.1A(b)	**Risk Rating** Low **Compliance Rating** 3	Incorrect Outage Data published on WEM Market Data webpage AEMO publishes Outage MW data on the WEM Market Data webpage (https://aemo.com.au/en/energy-systems/electricity/wholesale-electricity-market-wem/data-wem/market-data-wa). The published data corresponds to the data required to be collected under WEM rule clause 7.13.1A(b) - Planned Outages, Forced Outages and Consequential Outages. While performing compliance testing on the Equivalent Planned Outage Hours (EPOH) calculation, we found inconsistencies between the calculated EPOH values and the published outage data. AEMO have determined that the cause of the inconsistency is that the data published on the website is incorrect. AEMO have raised this as an urgent matter with AEMO's System	Implement a system fix to ensure that the published data is correct.

Ref	Issue Type & Obligation	Risk & Compliance Ratings	Finding	Recommendation
			Support team to correct the inconsistency. Note: This finding has a compliance rating of 3 as there is not a specific rule requirement to publish this data. However, AEMO should ensure that all data it publishes is correct.	

11 WEM Rules Chapter 7A – Balancing Market

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

11.1 Rule amendments

Changes to Chapter 7A are summarised below.

Rule change	Nature of changes
RC_2017_02: Implementation of 30-Minute Balancing Gate Closure	Changes to effect 30-minute gate closure

11.2 AEMO procedures

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

11.3 Operational compliance with Chapter 7A

11.3.1 Audit activities

We have

- Reviewed instances of self-reported non-compliance with Chapter 7A.
- Conducted process walkthroughs of AEMO's daily market operations.
- Discussed with AEMO the recent implementation of load forecasting improvements, including accuracy improvements that have been realised since project implementation.

11.3.2 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
19WEM1.25	**Issue Type** RBP reported compliance risk **Obligation** 7A.3.15	**Risk Rating** High **Compliance Rating** 2	Accuracy of Metrix and Similar Day forecasting methodologies deteriorating given increased PV 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). 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, 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). We in last year's audit, we found 8 instances of alternate forecasts being used for more than 2 hours, and no instances of more than 3 hours. In this audit year, there were 64 instances of alternate forecasts being used for more than 2 hours, and incidences occurring up to 6.3 hours. This is a substantial deterioration of the accuracy of the Metrix forecasting system within one year.	Closed - AEMO has implemented the recommendations to implement a forecasting improvement program, from the previous audit year. We note that this project has not improved the accuracy of real-time forecasts.

Ref	Issue Type & Obligation	Risk & Compliance Ratings	Finding	Recommendation
			The 'Similar Day' alternate forecasting methodology is not very satisfactory, as there is no guarantee that either of the 2 similar days will have a suitable value, and controllers frequently have to switch between multiple forecast types to find a suitable value. A project to improve the forecasting methodology is planned, but has not started (waiting for AR5 submission and completion of PSO project). Recommendation: 1) Implement forecasting improvement program - this will be an ongoing program of continuous improvement 2) Determine and implement methodology for assessing forecast accuracy	
20WEM1.04	**Issue Type** RBP reported non-compliance **Obligation** 7A.3.15, 7A.3.1(d)	**Risk Rating** Low **Compliance Rating** 1	RDQ forecasts published by AEMO do not always reflect best estimate of forecast load 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 Balancing Forecast. Clause 7A.3.1(d) requires AEMO to publish the Balancing Forecast. 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). 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, the control room operator will over-write the Metrix forecast in real time with an alternative forecast (if they deem the Metrix forecast to not be tracking well against the actual SCADA outputs). As the Metrix tool self-corrects within 15-20 minutes System Management considers that there is limited value in sending the alternative load forecast to the market (as an update under clause 7A.3.15), as the	This finding remains open as the forecasting project did not improve the accuracy of real-time forecasts (thereby removing the need to publish alternate forecasts). We therefore reiterate our recommendation from previous years for AEMO to publish alternate forecasts.

Ref	Issue Type & Obligation	Risk & Compliance Ratings	Finding	Recommendation
			Metrix forecast is still their best forecast for the next trading interval. However, if an alternative forecast is used for a period greater than a dispatch interval, then the published forecast is no longer the best forecast for the next trading interval. In these situations, System Management do not publish the alternative forecast, as under its current systems, there is no mechanism to publish alternate forecasts. This issue was raised in a previous audit (as finding 17WEM2.15) but was closed in the 2019 audit as forecasting enhancements were due to be delivered during this audit year, and the outcomes of this enhancement was to be a focus area of this audit. However, this project has been delayed, and will not be delivered in time to assess its outcomes as part of this audit. In addition, analysis of the use of alternative forecasts shows a significant increase in the use of alternate forecasts during this audit year. Use of alternate forecasts increased from an average of 3.5% of the time during the 2018/19 audit year to 6.5% during the 2019/20 audit year, reaching a peak of 14.8% in March 2020. On one occasion, alternate forecasts were used constantly for more than 28 hours during March 2020.	
20WEM1.28	**Issue Type** RBP reported non-compliance **Obligation** 7A.3.2 and Section 4 of MP: Balancing Market Forecast	**Risk Rating** Low **Compliance Rating** 1	Technically non-compliant tie breaking methodology practiced due to inadvertent removal of required tie breaking methodology from WEM Rules and Balancing Forecast Market Procedure During an update to both the WEM Market Procedures and the Market rules on 1 July 2019, an update was made to move the tie-breaking methodology of the BMO at the Maximum and Minimum STEM Price from the WEM Rules (Clause 7A.3.3), to the Balancing Market Forecast Market Procedure. During the process, details of the tie-breaking methodology were removed from	Update Market Procedure once Rule Change is finalised.

Ref	Issue Type & Obligation	Risk & Compliance Ratings	Finding	Recommendation
			both documents. [footnote: In particular, a multi-step process where tie-breaking was undertaken with preference for clearing generation under certain conditions (e.g., cleared for Upwards LFAS) was inadvertently removed]. As a result, the only process documented in both documents is random allocation. Since the WEM Rules and the Market Procedure were updated, AEMO has been conducting the tie-breaking process as was intended (by the predecessor documents). Hence, AEMO is in technical breach of the WEM Rules and the Balancing Market Forecast Market Procedure (but compliant with market objectives). A procedure change to the Balancing Market Forecast Market Procedure (APEC_2020_01) was commenced to resolve the issue and propose updates to the tie-breaker methodology. AEMO has since identified a manifest error with the implementation of the Forecast BMO (see 20WEM1.57) and accordingly APEC_2020_01 is on hold until that issue is resolved. This issue will be progressed to resolution once the issue with Forecast BMO is resolved. This finding will remain open until it is addressed via a Market Procedure change. AEMO are holding off making the change until the rule change required for finding 20WEM1.57 has been made.	
20WEM1.57	**Issue Type** RBP reported non-compliance **Obligation** 7A.3.2(a)	**Risk Rating** Low **Compliance Rating** 1	AEMO systems non-compliant with manifestly incorrect clause relating to loss-adjustment of offers submitted at price caps Clause 7A.3.2(a) requires AEMO to determine the BMO by loss adjusted prices in the Balancing Price PQ pairs into Loss-adjusted prices for all facilities other than the Balancing Portfolio.; Clause 7A.2.4(c) requires a participant's Balancing Submissions to be within the relevant WEM Price caps.	No further action recommended. This finding will remain open until either: - The manifest error rule change is implemented, and AEMO implements systems changes that are compliant with the new rules; or

Ref	Issue Type & Obligation	Risk & Compliance Ratings	Finding	Recommendation
			During internal testing for new software deployment (to support the Reduction of Prudential Exposure (ROPE) project), AEMO discovered a defect in WEMS' implementation of clause 7A.3.2(a). Particularly: *Where a facility's offer price is at the floor and the loss factor is greater than 1, WEMS erroneously sets the loss adjusted price at the WEM price floor (instead of using the loss adjusted price which would be greater than the floor). Hence, during Trading Intervals with the incorrect loss factor adjustment at the minimum price, the Balancing Price is understated. Since 2012, AEMO estimates the annual impact of the breach on minimum price events as -$97,459 (occurring in 2019) *Where a facility's offer price is at the cap, and the loss factor is greater than 1, WEMS erroneously sets the loss adjusted price at the WEM price cap (instead of using the loss adjusted price which would be lower than the cap). Hence, during Trading Intervals with the incorrect loss factor adjustment at the maximum price, the defect results in the Balancing Price is overstated. Since 2012, AEMO estimates the annual impact of the breach on maximum price events to have ranged from $31,398 (2019) to $457,906 (2015) [footnote]. Note that the above issue only manifests for IPPs with loss factors greater than one. footnote: AEMO has estimated the impact of the breach on the Balancing Price. The actual impact for each Market Participant will be different due to energy traded through the STEM and bilaterally – only Market Participants exposed to the Balancing Price would be impacted. This analysis assume the worst case where all energy is traded at the Balancing Price. While WEMS' behaviour is inconsistent with the current rules, we note that the behaviour of the system is preferable in that any application of price caps should	- The Settlements Enhancements project is put into production, and AEMO demonstrates that the material impacts of this issue are minor

Ref	Issue Type & Obligation	Risk & Compliance Ratings	Finding	Recommendation
			be done after loss adjustment and not at the time of submission (as this can create unintended consequences for facilities providing Ancillary Services who offer at the price floor, and may end up being curtailed/decommitted as a result of their loss factor). As such AEMO has identified a manifest error in the rules, whereby the application of the price limit in the Balancing Market Submission in clause 7A.2.4(c) is erroneous, and that the application of price caps should occur after the prices in the PQ pairs have been adjusted under clause 7A.3.2(a). The proposed change has been presented to the Market Advisory Committee, who have agreed to proceed with a rule change to align the rules with current practice. As well as the above rule change process, the Settlements enhancements project will implement Loss Factor adjustments that are compliant with the current clause 7A.3.2(a).	

12 WEM Rules Chapter 7B – Load Following Service Market

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

12.1 Rule amendments

Changes to Chapter 7B are summarised below.

Rule change	Nature of changes
RC_2017_02: Implementation of 30-Minute Balancing Gate Closure	Changes to effect 30-minute gate closure

12.2 AEMO procedures

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

12.3 Operational compliance with Chapter 7B

12.3.1 Audit activities

We have reviewed:

- Self-reported instances of non-compliance with Chapter 7B
- AEMO's daily market operations process
- AEMO's Load Following Ancillary Service (LFAS) dispatch process.
- LFAS activation data over the Audit Period.

12.3.2 Audit findings

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

Table 17: Operational compliance findings associated with Chapter 7B of the WEM Rules

Ref	Issue Type & Obligation	Risk & Compliance Ratings	Finding	Recommendation
20WEM1.50	**Issue Type** RBP reported compliance risk **Obligation** 7B.3.6	**Risk Rating** Low **Compliance Rating** 2	Implemented controls have not sufficiently addressed problem of under-activation of LFAS. In a number of self-reported breaches, System Management has reported on 10 instances of under-activation of LFAS covering 100 periods (555,556,557,562,564,565,576,595,601,613). Various preventative controls have been cited (training, XA21 alerts, SOCCUI modifications) however these controls do not appear to be effective, as the issue is recurring after the implementation of these controls. Human error following the change from a fixed LFAS requirement to a two-level time-based requirement has also been cited as a contributing factor, however instances of under-activation are still occurring many months after the change. For example, there were 16 periods of under-activation in February 2020. Recommendation: Investigate causes of LFAS under-activation and develop solutions (systems or processes) to prevent this issue.	This finding is closed and replaced with an updated finding, see 21WEM1.37
20WEM1.56	**Issue Type** RBP reported non-compliance	**Risk Rating** Low **Compliance**	Failure to issue DAs for insufficient LFAS activation We have found 63 trading periods with greater than 1 MW shortfall in LFAS Up, and 51 trading periods with greater than 1 MW shortfall in LFAS Down in audit	Closed - AEMO has reinforced its Dispatch Advisory Guidelines and circulated a Dispatch

Ref	Issue Type & Obligation	Risk & Compliance Ratings	Finding	Recommendation
	Obligation 7B.3, 7B.4, 7.11.5(c)	**Rating** 1	year to date. Some of these cases have been reported as self-reported breaches, but there are more cases than have been reported. Nothing is being logged in the control room log sheets regarding these shortfalls. Examples: 24 Feb 2020 07:00 - 08:30 Activated LFAS up = 67 MW Requirement = 85 MW 20 Feb 2020 14:00 - 15:00 Activated LFAS Up = 74 MW Requirement = 85 MW 07 Feb 2020 14:30 - 15:30 Activated LFAS Up = 79 MW Requirement = 85 MW 7.11.5(c) requires that Dispatch Advisories are sent when Ancillary Service requirements will not be fully met, but no DAs have been issued for these events. Recommendation: Investigate system changes and/or training to mitigate LFAS shortfall occurrences, to prevent the need to issue DAs for insufficient ancillary services.	Advisory "cheat sheet" as a resource to assist controllers identify triggers for Dispatch Advisory issuance. See also 21WEM1.37.
21WEM1.01	**Issue Type** AEMO reported non-compliance **Obligation** 7B.3.6	**Risk Rating** Medium **Compliance Rating** 1	Failure to activate sufficient LFAS This breach occurred in the previous audit period but was self-reported in the current audit period. AEMO under activated LFAS Up and Down by 1MW over six Trading Intervals on 21 June 2020. The shortfall was for intervals 8-1, 13-1, 13-2, 14-1, 15-1 and 15-2. A shortfall of this nature is immaterial with respect to power system security outcomes, and also potential impacts on the LFAS price formation. Given this is a recurring breach over multiple years, and effective remediating controls are unlikely to be implemented during the audit year, we deem the likelihood of recurrence to be Almost Certain. As such we deem this breach to be Medium rated finding. Note all other LFAS breaches are likewise rated Medium (except where otherwise	See 21WEM1.37.

Ref	Issue Type & Obligation	Risk & Compliance Ratings	Finding	Recommendation
			indicated) as the quantity of the shortfall is immaterial or minor in terms of impact, but Almost Certain in terms of likelihood of recurrence.	
21WEM1.03	**Issue Type** AEMO reported non-compliance **Obligation** 7B.3.6	**Risk Rating** Medium **Compliance Rating** 1	Failure to activate sufficient LFAS AEMO under activated LFAS Up and Down by 18MW over three Trading Intervals on 24 June 2020. The under activation occurred during the morning ramp (intervals 7-1, 7-2 and 8-1).	See 21WEM1.37.
21WEM1.05	**Issue Type** AEMO reported non-compliance **Obligation** 7B.3.6	**Risk Rating** Medium **Compliance Rating** 1	Failure to activate sufficient LFAS AEMO under activated LFAS Up and Down over three Trading Intervals on 5 September 2020. The intervals were 18-2, 19-1 and 19-2. The amount of LFAS Up and Down that was under activated by in intervals 18-2 and 19-1 was under 2MW. In interval 19-2 AEMO under activated LFAS Up by 49MW.	See 21WEM1.37.
21WEM1.06	**Issue Type** AEMO reported non-compliance **Obligation** 7B.3.6	**Risk Rating** Medium **Compliance Rating** 1	Failure to activate sufficient LFAS AEMO under activated LFAS Up and Down by 14MW over four Trading Intervals on 12 September 2020.	See 21WEM1.37.
21WEM1.15	**Issue Type** AEMO reported non-compliance **Obligation** 7B.3.6	**Risk Rating** Low **Compliance Rating** 1	Incorrect Facility activated for LFAS During the transition to the altered gate closure times implemented by RC_2017_02, AEMO activated incorrect Facilities for LFAS. This occurred as a result of a systems issue which meant that cleared LFAS quantities did not transfer correctly to SM's systems. This meant that for 12 trading intervals over three	Closed - AEMO has deployed a system fix to address the defect that caused this breach.

Ref	Issue Type & Obligation	Risk & Compliance Ratings	Finding	Recommendation
			trading days non-Synergy facilities that had bid out of the LFAS market were incorrectly activated; the consequence being that Synergy was under-activated relative to its cleared quantities (no shortfall, as another facility was activated instead). The underlying system defect has since been rectified. No further actions are recommended.	
21WEM1.16	**Issue Type** AEMO reported non-compliance **Obligation** 7B.3.6	**Risk Rating** Medium **Compliance Rating** 1	Failure to activate sufficient LFAS AEMO under activated LFAS Up by 6MW over two Trading Intervals on 30 Dec 2020 (06-2 and 07-1).	See 21WEM1.37.
21WEM1.17	**Issue Type** AEMO reported non-compliance **Obligation** 7B.3.6	**Risk Rating** Medium **Compliance Rating** 1	Failure to activate sufficient LFAS AEMO under activated LFAS Down by 3.5-6MW over two Trading Intervals between 16:00-17:00am on 7 Jan 2021.	See 21WEM1.37.
21WEM1.25	**Issue Type** AEMO reported non-compliance **Obligation** 7B.3.6	**Risk Rating** Medium **Compliance Rating** 1	Failure to activate sufficient LFAS This breach occurred in the previous audit period but was self-reported in the current audit period. AEMO under activated LFAS Up by 6MW over four Trading Intervals on 20 June 2020. The shortfalls were --6MW shortage in 16-1 and 16-2	See 21WEM1.37.

Ref	Issue Type & Obligation	Risk & Compliance Ratings	Finding	Recommendation
			--39MW shortage in 17-2 --37MW shortage in 18-1 The latter two shortfalls were larger in magnitude (one occurring during the evening ramp period) and could have had a more serious impact on both power system and market outcomes.	
21WEM1.26	**Issue Type** AEMO reported non-compliance **Obligation** 7B.3.6	**Risk Rating** Medium **Compliance Rating** 1	Failure to activate sufficient LFAS AEMO under activated LFAS down by 26-32MW over two Trading Intervals (19:00-20:00) on 14 August 2020.	See 21WEM1.37.
21WEM1.27	**Issue Type** AEMO reported non-compliance **Obligation** 7B.3.6	**Risk Rating** Medium **Compliance Rating** 1	Failure to activate sufficient LFAS AEMO under activated LFAS Up by 14 MW over two Trading Intervals (18:30-19:30) on 1 November 2020.	See 21WEM1.37.
21WEM1.71	**Issue Type** AEMO reported non-compliance **Obligation** 7B.3.6	**Risk Rating** Medium **Compliance Rating** 1	Failure to activate sufficient LFAS AEMO under activated LFAS Up and Down 0.158 MW over two Trading Intervals (11:00-12:00) on 19 Jan 2021.	See 21WEM1.37.
21WEM1.29	**Issue Type** AEMO reported non-compliance **Obligation** 7B.3.6	**Risk Rating** Medium **Compliance Rating** 1	Failure to activate sufficient LFAS AEMO under activated LFAS Up and Down 2 MW over two Trading Intervals (05-2, 06-1) on 20 Feb 2021.	See 21WEM1.37.

Ref	Issue Type & Obligation	Risk & Compliance Ratings	Finding	Recommendation
21WEM1.34	**Issue Type** AEMO reported non-compliance **Obligation** 7B.3.6	**Risk Rating** Medium **Compliance Rating** 1	Failure to activate sufficient LFAS AEMO under activated LFAS Down by 6MW over two Trading Intervals (07:00-08:00) on 10 September 2020.	See 21WEM1.37.
21WEM1.63	**Issue Type** AEMO reported non-compliance **Obligation** 7B.3.6	**Risk Rating** Medium **Compliance Rating** 1	Failure to activate sufficient LFAS AEMO under activated LFAS Up over three Trading Intervals on 26 May 2020. The shortfall was 16MW in intervals 15-1 and 16-1, and 26MW in 16-2.	See 21WEM1.37.
21WEM1.37	**Issue Type** RBP reported non-compliance **Obligation** 7B.3.6	**Risk Rating** Medium **Compliance Rating** 1	Failure to activate sufficient LFAS RBP has reviewed LFAS activation data from between July and March 2020 and has noted a number of instances of under-activation of LFAS (over and above the instances self-reported by AEMO). We have noted 43 Trading Intervals in which LFAS was under-activated. Of these, 27 instances had shortages less than 10MW, 8 had shortages between 10MW-20MW, 5 had shortages between 20-30MW and 3 had shortages between 30-40MW. This trend is consistent with what we have noted in previous years, and the root cause is related to the fact that the LFAS dispatch of Synergy is manual. Moreover, when an Independent Power Producer (IPP) changes its bid such that Synergy's activation must be updated, this trigger is not immediately obvious to AEMO controllers due to the nature of the display on SOCCUI. AEMO is targeting the end of the current financial year to implement changes to SOCCUI that would make IPP bid changes, and the required changes to the Synergy portfolio more visible.	We recommend AEMO continue with its plans to deploy SOCCUI changes to make LFAS merit order changes affecting the Synergy portfolio more visible to controllers.

Ref	Issue Type & Obligation	Risk & Compliance Ratings	Finding	Recommendation
			Another contributing factor is that the XA21 alarm which notifies a controller of LFAS enablement can be deactivated if multiple alarms go off at the same time and the controller acknowledges the alarm (hence the controller may not be aware than there was an under-activation alarm that had sounded also). Additionally, the XA21 alarm does not specify how much additional LFAS must be activated from the Synergy portfolio, or which facilities should be activated; as such manual intervention is needed after a controller is alerted to under activation via the alarm. When AEMO transitions to its own EMS later in the year, it intends to implement more effective alarms. Until the above remediating actions are put in place, recurrences of similar breaches are almost certain. However, we note that the vast majority of the shortfalls have been small quantities with minor to immaterial impacts on the power system and on the market. As such, we deem the risk rating to be medium.	

13 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.

13.1 Rule amendments

There have been minor cosmetic amendments to Chapter 8 of the WEM Rules as part of WEM reform. However, none of these amendments impact on the interpretation and application of Chapter 8.

13.2 AEMO procedures

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

13.3 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.

14 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.

14.1 Rule amendments

Changes to Chapter 9 are summarised below.

Rule change	Nature of changes
RC_2019_04: Administrative Improvements to Settlement	Administrative improvements to settlement process

14.2 AEMO procedures

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

14.3 Operational compliance with Chapter 9

14.3.1 Audit activities

We have reviewed:

- Self-reported instances of non-compliance with Chapter 9
- AEMO's Settlements (STEM and Non-STEM) verification procedures and tools

14.3.2 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 18: Operational compliance findings associated with Chapter 9 of the WEM Rules

Ref	Issue Type & Obligation	Risk & Compliance Ratings	Finding	Recommendation
20WEM1.06	**Issue Type** RBP reported non-compliance **Obligation** Appendix 2, Step 1	**Risk Rating** Low **Compliance Rating** 1	Intermittent loads without registered facilities not allocated SR share Step 1 of Appendix 2, states that, when calculating the applicable capacity for the purpose of allocating Spinning Reserve Service costs: *If facility f is a Synergy Scheduled Generator without an interval meter or an unmetered generation system serving Intermittent Load then this is double the MWh sent out generation of that facility based on SCADA data for Trading Interval t.* In the 2020 WEM Audit, it was reported that no Spinning Reserve Cost Share is calculated for intermittent loads without a registered generator, regardless of facility import or export levels. This is not compliant with step 1 of Appendix 2. There are two facilities in this category, and as a result, other participants will have slightly higher SR Cost Shares. A due date of 30 June 2021 for closing this issue was set based on this understanding of the issue. AEMO have investigated this issue further and determined that the situation is more complex than previously reported. The current implementation calculates the applicable capacity based on the net generation – i.e. the generation less the associated intermittent and	Await EPWA determination

Ref	Issue Type & Obligation	Risk & Compliance Ratings	Finding	Recommendation
			non-intermittent loads. This results in no allocation of SR costs to intermittent load facilities with unregistered generation, and is not compliant with the rules. In determining the correct implementation, AEMO have found that there is an ambiguity in the WEM rules regarding the treatment of multiple generation units serving an intermittent load – should an applicable capacity be calculated for each unit, or should a single applicable capacity be calculated based on the sum of all unit's generation. This ambiguity affects the treatment of all intermittent loads with multiple generation units, not just those with unregistered generation. Given this ambiguity and the materiality of the issue, AEMO is seeking policy advice from AEMO for implementing a fix for this issue. Consequently, a fix has not been implemented, and this issue will remain open.	
20WEM1.44	**Issue Type** RBP reported non-compliance **Obligation** 9.9.2(p)	**Risk Rating** Low **Compliance Rating** 1	**Erroneous LF_Capacity_Cost_Share calculation for participants registering part way through a month** While certifying the defect fix for Breach 20WEM1.07 (AEMO ref 547) above, RBP noted a similar software defect affected AEMO's compliance with clause 9.9.2(p) which calculates the LF_Capacity_Cost_Share of a participant in a given Trading Month. As with the LF_Market_Cost_Share calculation, this quantity is the sum over Trading Intervals of the product of a monthly value (LF_Share calculated under clause 3.14.1) and a Trading Interval value. A similar	Closed – No further action required.

Ref	Issue Type & Obligation	Risk & Compliance Ratings	Finding	Recommendation
			defect in AEMO's settlement system means that when a participant registers part way through a month, their capacity related LFAS cost share will be zero for all Trading Intervals in which they were unregistered, but for which their associated NMIs would have had non-zeros metered schedules. As with Breach 547, this would manifest as a shortfall as the total Load Following Capacity cost calculated under clause 9.9.2(q) would be higher than what was collected from participants under clause 9.9.2(p). As with Breach 20WEM1.07 (AEMO ref 547) 7, this error would only manifest when a Market Customer registers part way through a month and acquires NMIs in that month. Hence, the historical impact of this defect is likely to be negligible. AEMO has commenced the fix required to address this defect and expected go-live date was 30 June 2021. The software fix was deployed on 10 March 2021, so this finding can be closed.	
21WEM1.30	Issue Type AEMO reported non-compliance Obligation Multiple	Risk Rating Low Compliance Rating 1	Multiple Settlement Implementation Issues 5 settlement system implementation issues were flagged through the RoPE project. The issues will be resolved by Settlements Enhancements or require a Rule Change as the WEM Rule is inconsistent/unclear. One item is mitigated through the process of using a consistent Work Instruction. All issues related to settlement implementation and therefore may have a financial impact on Market Participants.	Implement fixes for Issues 1 and 3 as part of the Settlements Enhancements project.

Ref	Issue Type & Obligation	Risk & Compliance Ratings	Finding	Recommendation
			1. Int Load Metered Schedules - MSG (MW instead of MWh) (Appendix 1 (b) iii). Solution: Settlements Enhancements 2. SR Costs - inconsistent Facility terms (Appendix 2). Solution: Rule Change Register: MDIL-189 3. Facility Capacity Rebate eligibility (4.26.6(e)i.2). Solution: Settlements Enhancements 4. Max2 (4.26.1.(b)). Solution: Rule Change Register: MDIL-242 5. Unregistered generation systems (4.12.7, 4.12.4). Solution: Process in place to mitigate risk: Work Instruction: Metering - Registration in MDW These issues have been described in an AEMO internal email as having "minor-immaterial impact", and only occur in rare circumstances. Issues 1 and 3 will be resolved by the Settlements Enhancements Project, which is expected to go live on 1 July 2021. Issues 2, 4 and 5 relate to manifest errors in the WEM rules. Issues 2 and 4 have been entered into the Rule Change Register. Issue 5 has been mitigated via work instructions to ensure consistent treatment.	
21WEM1.64	**Issue Type** AEMO reported non-compliance **Obligation** 9.19.1	**Risk Rating** Low **Compliance Rating** 1	Use of amended data set in NSTEM adjustment without notice of disagreement. Background: On 15/04/2020, AEMO used an amended data set to adjust settlement as part of the NSTEM October 2019 Adjustment 1 process without a letter of disagreement. Cause: Human error. The dataset was loaded to the settlements system late, which caused the dataset used in the October 2019 NSTEM Adjustment 1 to be different to the October 2019 NSTEM	Closed – No further action required.

Ref	Issue Type & Obligation	Risk & Compliance Ratings	Finding	Recommendation
			initial settlement. Impact: Immaterial. Although this is considered a technical breach of the rules, the dataset used in the actuals and a more accurate representation for settlement. Additionally, a rule change commencing 02/04/2020 allows AEMO to make adjustments to settlements where AEMO has revised value, which would have addressed this technical breach if implemented prior to the incident. Rule Change RC_2019_04, commended July 2020, addresses this issue - Closed.	

15 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.

15.1 Rule amendments

Changes to Chapter 10 are summarised below.

Rule change	Nature of changes
Minister amended rules - Constraints framework and governance	Confidentiality class of Congestion Information Resource (implementation deferred under transitional provisions)
RC_2019_05: Amending the Minimum STEM Price definition and determination	New AEMO obligations to set confidentiality class for Minimum STEM Price, and information used to set the Minimum STEM Price

15.2 AEMO procedures

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

15.3 Operational compliance with Chapter 10

We have conducted no audit activities pertaining to Chapter 10 of the WEM Rules.

15.3.1 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 19: Operational compliance findings associated with Chapter 10 of the WEM Rules

Ref	Issue Type & Obligation	Risk & Compliance Ratings	Finding	Recommendation
20WEM1.33	Issue Type RBP reported non-compliance Obligation 10.2.4, 10.2.2(d)	Risk Rating Medium Compliance Rating 1	Disclosure of Rule Participant Restricted information to unauthorised person Clauses 10.2.2(d) and 10.2.4 of the WEM Rules set out the confidentiality requirements for Rule Participant Dispatch Restricted information. This information may not be shared with members of the public. On 02 November 2019, AEMO noticed a Registered Facility was experiencing issues and was not meeting their most recently issued Dispatch Instruction. AEMO attempted to call the Facility three times, using a contact's details in XA/21 and separate contact's details in the BT Phones, however, the contact did not pick up. Approximately 33 minutes later, the contact whose details were in the BT Phone directory returned AEMO's call. The call began with the AEMO employee discussing details surrounding the issues the Facility may be experiencing, what the Facility current output was and what their Dispatch Instruction target had the Facility Dispatched to. The contact then advised they did not	Closed - corrective actions have been implemented.

			work for the Market Participant and had not done so for the last 4 months. The AEMO employee then continued to discuss the Facilities dispatch position and advised they would constrain the Facility. This information is considered Rule Participant Dispatch Restricted information and cannot be shared with the public. The call was discovered by compliance when conducting routine phone call checks prior to issuance to the ERA as part of alleged breach information requests. As a result of this breach, AEMO is planning on taking the following actions: 1. Conduct a reconciliation of contact records within XA/21, BT phones and WEMS to ensure they are up to date 2. Move to a single contact repository, whether it be XA/21, BT or WEMS to reduce likelihood of using outdated information 3. Implement a script, whereby the controller will identify themselves and request the caller identify who they are and what Facility/Market Participant they are from. 4. Increase the controllers' knowledge surrounding confidentiality risks and the requirements under the WEM rules These corrective actions are currently outstanding.	
20WEM1.51	**Issue Type** RBP reported non-compliance **Obligation** 10.7.1.(e)	**Risk Rating** Medium **Compliance Rating** 1	**Confidentiality breach from sending Credit Limit letter to wrong participant** As part of mitigating actions to manage the impacts of Covid19 on participant default, AEMO has increased the frequency of its Credit Limit Reviews to monthly as opposed to six monthly. During the April 2020 Credit Limit Review, AEMO determined new Credit Limits for two participants. AEMO's processes involve sending	Closed – no further actions required.

			out a letter to the Market Participants via email detailing the outcome of the review. This email also contains the relevant participant's NSTEM and STEM settlement statements from the previous 12 months. On 28 April 2020, at 15:49, AEMO sent one of the participant's Credit Limit letters to the wrong participant, thereby breaching clause 10.7.1.(e) of the WEM Rules. AEMO took the following immediate corrective steps (which we have verified, with the exception of the attempt to recall the email: we accept AEMO's verbal assertion in this respect): *AEMO realised its mistake two hours after the error (18:09) and attempted to recall the message. *On 29 April 2020 at 11:25, AEMO contacted the participant to whom the letter had been sent in error and requested that they immediately delete it. The participant responded at 12:11 confirming they had done so. *On 11 June 2020, AEMO informed the affected participant of the confidentiality breach. AEMO WA have identified the cause as human error. In addition to the immediate corrective actions AEMO has: - Discussed the confidentiality breach with the individual involved to provide a reminder on required processes and importance of data confidentiality. - Provided a reminder to the WA Market Operations team on importance of processes and data confidentiality. - Included a Credit Support and Credit Limit module in the RoPE project (for deployment in August 2020) that will remove the need to send prudential details by email. We have sighted the release notes for this change.	

			More broadly AEMO has: - Established a 'tiger team' across AEMO to look at root causes of confidentiality breaches and identify solutions. - Will roll out organisation wide privacy and confidentiality training. We deem this to be a medium risk finding based on a likelihood rating of unlikely (as AEMO has adequate controls in place, and we are satisfied with AEMO's remediating actions) and an impact rating of moderate (based on moderate reputational impacts and minor market impacts). A change has been made so that participants access their own CR letter via their existing WEMS access, eliminating manual sending out of emails. This removes the risk of this recurring. Closed.	

16 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 16.1 sets out our review of AEMO's market software systems.
- Section 16.2 sets out our review of AEMO's general IT controls, including processes for software management.

16.1 Compliance of AEMO software

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

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

- WEMS
- POMAX Settlements
- POMAX Metering
- RCM
- RTDE

16.1.1 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 WEM Procedures.

16.1.2 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 17.2.

For this audit, we reviewed the release notes for all changes made to AEMO's market systems during the Audit Period. Many 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 20, 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 20: Changes to AEMO market systems in the Audit Period

System	Version number	Release date	Material effect on prices / quantities?	Certification status
WEMS	3.35-1513-3	2/07/2020	No	Maintained
WEMS	3.35-1513-4	19/08/2020	No	Maintained
WEMS	3.36-1529-2	2/09/2020	No	Maintained
WEMS	3.37-1532-3	25/11/2020	No	Maintained
WEMS	3.37-1532-4	11/01/2021	No	Maintained
Prudential Service	1.3-735-6	1/07/2020	No	Maintained
Prudential Service	1.3-735-13	2/07/2020	No	Maintained
Prudential Service	1.4-780-3	19/08/2020	Yes	Certified 24/08/2020
Prudential Service	1.5-786-2	25/02/2021	No	Maintained
RCM	1.16-2984-1	19/08/2020	No	Maintained
RCM	1.17-2985-3	2/09/2020	No	Maintained

System	Version number	Release date	Material effect on prices / quantities?	Certification status
RCM	1.18-2988-3	7/10/2020	Yes	Certified 7/10/2020
RCM	1.18-2988-4	19/10/2020	No	Maintained
RCM	1.19-2991-1	25/11/2020	No	Maintained
Pomax Settlements	3.4.37	30/09/2020	Yes	Certified 30/09/2020
Pomax Settlements	3.4.39	15/02/2021	Yes	Certified 15/02/2021
Pomax Metering (MDW)	20.5.0	20/10/2020	Yes	Certified 20/10/2020
RCM Settlement Service (RCM Settlement)	1.7-153-1	15/12/2020	Yes	Maintained

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.

16.1.3 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.

16.2 SOFTWARE MANAGEMENT PROCESSES

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

16.2.1 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)

We also requested that AEMO reproduce results from STEM settlement systems (for Trading Week 19 of the Audit Period) to test their compliance with rule clause 2.36.1(b).

16.2.2 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

16.2.3 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 16.1.2, the core market systems and the non-core market software referenced in Section 16.1.2 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 16.1.2 to be compliant with the WEM Rules and WEM 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.

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 demonstrated that they have maintained each version of the software in a state where results previously produced with that version can be reproduced as required by clause 2.36.1(b) of the WEM Rules.
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.
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
20WEM1.49	**Issue Type** RBP reported non-compliance **Obligation** 2.36.1(b)	**Risk Rating** Low **Compliance Rating** 1	Ability to reproduce past results has not been demonstrated by AEMO WEM rule 2.36.1(b) requires that AEMO "maintain each version of the software in a state where results produced with that version can be reproduced for a period of at least one year from the release date of the last results produced with that version". In our 1st information request, submitted on 10 March 2020, we requested that AEMO reproduce the results of the RCM Settlements run outputs for January 2019 as produced from AEMO production systems in March 2019. As of 5 June 2020, this has not been completed by AEMO, and feedback from AEMO indicates that attempts to perform the required restoration from backups have failed. We therefore conclude that, while AEMO may eventually be able to perform the reproduction, the ability to reproduce past results has not been maintained by AEMO. Recommendation: Resolve issues preventing ability to reproduce past results in a timely fashion.	Closed - AEMO has introduced improved data backup capability and introduced a new technology solution (VEEAM/Data Domain). With this solution comes an improved proactive monitoring capability to ensure backups have completed successfully and the critical files needed are quickly available in both disk and tape related backups.

17 APPENDICES

17.1 COMPLIANCE AND RISK RATING INFORMATION

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

17.1.1 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 areas for improvement 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.
High	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				
		Immaterial	*Minor*	*Moderate*	*Major*	*Extreme*
LIKELIHOOD	*Almost Certain*	Medium	Medium	High	Critical	Critical
	Likely	Low	Medium	High	Critical	Critical
	Possible	Low	Medium	High	High	Critical
	Unlikely	Low	Low	Medium	Medium	High
	Rare	Low	Low	Medium	Medium	High

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

17.1.2 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 multiple occurrences
Possible	11% - 50%	May occur, but not expected in most circumstances; statistical record of a few occurrence
Unlikely	1% - 10%	Conceivable but unlikely to occur in any given year; statistical record of at least one occurrence
Rare	<1%	Will only occur in exceptional circumstances; no history of occurrence

17.1.3 AEMO impact ratings

AEMO's impact rating matrix is provided below. When assessing the financial impact of non-compliance and risk on market participants, we have used the Financial (AEMO) category below as a guideline to assign risk ratings.

Type of impact	EXTREME	MAJOR	MODERATE	MINOR	IMMATERIAL
Reputation & Stakeholders	Significant long-term damage to stakeholder confidence and relationships; total loss of public confidence; intensive adverse media exposure	Significant short term damage to stakeholder confidence and relationships; some loss of public confidence; adverse media exposure	Some damage to stakeholder confidence and relationships	Manageable reduction in stakeholder confidence	No lasting effects
AEMO Financial Impact	>$25M	>$5M-25M	>$500K-$5M	>$100K-$500K	<$100K
Safety	Single fatality or permanent injury or widespread impact on public safety	Serious injury requiring hospitalisation >5 days or localised impact on public safety	Injury requiring <5 days hospitalisation or medical treatment	Medical treatment only	First aid
Infrastructure, Assets & Environment	Permanent long term effect and or rectification not possible	Significant effect, difficult rectification	Measurable effect, easy rectification	Measurable effect, no rectification required	No measurable damage or effect
Market	Loss of supply to >50% of customer demand in any one jurisdiction or >25% across multiple jurisdictions Market suspension in one jurisdiction or market	Loss of supply to >25% of customer demand in any one jurisdiction or >10% across multiple jurisdictions Market suspension in one jurisdiction or market	Loss of supply to >10% of customer demand in any one jurisdiction or >5% across multiple jurisdictions Market operating in an administered state for > 5 days for gas market or >1 day for electricity market	Loss of supply to >5% of customer demand in any one jurisdiction or >2% across multiple jurisdictions Market operating in an administered state for <5 days for gas market or <1 day for electricity market	No restriction of supply No disruption to markets
Legal & Regulatory	Imprisonment or fine >$100 personal liability to officer or director of company Disqualification as officer/director Regulator or parliamentary inquiry with loss of market participants and public confidence	>$100K personal liability to officer or director Disqualification as officer/director Regulator or parliamentary inquiry with substantial loss of reputation, financial cost, loss of stakeholder confidence, political impact	Fine of less than $100K and no personal liability Regulator or government inquiry with loss of reputation or adverse government impact	Nominal fine Regulator or government inquiry resolved by routine management procedures	No fine No government or regulator inquiry

17.2 Historical market software certification prior to the 2020-21 Audit Period

17.2.1 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 WEM Procedures.

17.2.2 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 WEM 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 WEM 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.

17.2.3 Summary of historical 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 2011-2020 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
WEMS	3.21-1236-20	No	Maintained
WEMS	3.22-1297-5	Yes	Certified
WEMS	3.23-1336-1	No	Maintained
WEMS	3.24-1356	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
Metering	11.0.35	Yes	Certified
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
Settlements	3.4.17	No	Maintained
Settlements	3.4.18	Yes	Not Certified

System	Version number	Changes to calculations affecting market outcomes?	Certification status
Settlements	3.4.22	No	Not Certified
Settlements	3.4.21	No	Not Certified
RTDE	1.27-1	Yes	Certified
RCM	1.0-1803	Yes	Certified
RCM	1.1-2098-8	Yes	Certified
RCM	1.2-2176-5	Yes	Certified
RCM	1.3-2272-1	Yes	Certified
RCM	1.4-2366-2	Yes	Certified
RCM	1.5-2570	No	Maintained
WEMS	3.27-1410-1	No	Maintained
RCM	1.9-2787-2	Yes	Certified
WEMS	3.27-1410-2	No	Maintained
POMAX	3.4.25	No	Maintained
WEMS	3.27-1410-4	No	Maintained
RCM	1.9-2787-4	No	Maintained
POMAX	3.4.26	No	Maintained
WEMS	3.28-1438-2	No	Maintained
RCM	1.10-2842	No	Maintained
RCM	1.10-2871-6	No	Maintained
WEMS	3.28-1438-6	No	Maintained
WEMS	3.35-1513-3	No	Maintained
WEMS	3.35-1513-4	No	Maintained
WEMS	3.36-1529-2	No	Maintained
WEMS	3.37-1532-3	No	Maintained
WEMS	3.37-1532-4	No	Maintained
Prudential Service	1.3-735-6	No	Maintained

System	Version number	Changes to calculations affecting market outcomes?	Certification status
Prudential Service	1.3-735-13	No	Maintained
Prudential Service	1.4-780-3	Yes	Certified
Prudential Service	1.5-786-2	No	Maintained
RCM	1.16-2984-1	No	Maintained
RCM	1.17-2985-3	No	Maintained
RCM	1.18-2988-3	No	Maintained
RCM	1.18-2988-4	No	Maintained
RCM	1.19-2991-1	No	Maintained
Pomax Settlements	3.4.37	Yes	Certified
Pomax Settlements	3.4.39	Yes	Certified
Pomax Metering (MDW)	20.5.0	Yes	Certified
RCM Settlement Service (RCM Settlement)	1.7-153-1	No	Maintained