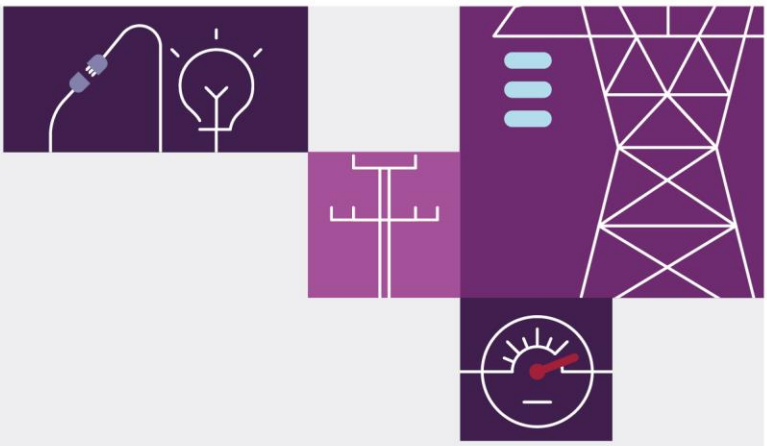
REPORT: EFFECTIVENESS OF THE NEM PRUDENTIAL SETTINGS METHODOLOGY

December 2023

Credit Limit Procedures

A report for the National Electricity Market

AEMO
AUSTRALIAN ENERGY MARKET OPERATOR



Important notice

Purpose

AEMO has prepared this document in accordance with clause 3.3.8(f) of the National Electricity Rules (NER) to provide information about AEMO's annual review of the effectiveness of the methodology used to determine the prudential settings for Market Participants as described in the credit limit procedures (CLP) in achieving the objective of the CLP as described in clause 3.3.8(b) of the NER. This review analysed AEMO prudentials data from the period 1 September 2022 to 31 August 2023 and is otherwise generally based on information available to AEMO as at the date of publication, unless otherwise indicated.

Disclaimer

To inform its review and the findings expressed in this report, AEMO has collated information from its own observations, records and systems. Any views expressed in this report of those of AEMO unless otherwise stated. AEMO has made reasonable efforts to ensure the quality of the information in this document but cannot guarantee its accuracy or completeness.

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Version control

Version	Release date	Changes
1	20/12/2023	Final Report

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Executive summary

Under clause 3.3.8(f) of the National Electricity Rules (NER), AEMO is required to annually review and publish its findings on the effectiveness of the credit limit procedures in achieving the objective of establishing a process for setting prudential settings for each market participant so that the prudential standard is met for the NEM. The 2023 review analysed prudentials data from 1 September 2022 to 31 August 2023, assessing whether the Maximum Credit Limits (MCL) were set appropriately and whether the prudential standard was met.

The 2023 review found the following:

- MCLs were set at a sufficient level for the summer, winter and shoulder seasons in the analysis period, with reasonable alignment between MCLs and actual market conditions in all regions. Participants continued to provide additional bank guarantees above the MCL requirements, however the gap between the two has narrowed indicating that overall, market participants believed MCLs were better aligned with outstandings than has been the case over the past few years. There was minimal use of security deposits with higher MCLs and relatively benign market conditions negating the need for additional prudential coverage.
- MCL and guarantee levels have increased to their highest levels since 2011. Conversely, outstandings have moderated since the highs of winter 2022, but on average, outstandings are still higher than they have been over the past 10 years. The outstandings levels in the winter seasons were significantly higher than summer seasons in 2021, 2022 and 2023, suggesting that increasingly winter is the season with higher prudential risks.
- The discrepancy between estimated average future regional reference prices (RRP) used in MCL calculations, and actual prices has moderated over the analysis period, with actual prices somewhat above estimated average future RRP in NSW, QLD and TAS and below estimated average future RRP for the SA and VIC regions. This is in contrast to winter 2022, when actual prices were two to three times higher than the estimated average future RRPs in all regions.
- The prudential standard was exceeded in the NSW region at 3.0%, the QLD region at 2.9%, the VIC region at 3.2% and the TAS region at 5.2%. These prudential exceedance values were almost unchanged from the previous year. Despite the prudential standard being so exceeded, there were no payment shortfalls over the analysis period.

AEMO will continue to explore additional ways the Rules, regional model and/or the CLP could be updated to ensure that MCLs are set appropriately, and the prudential standard is met in the future. In 2024 this will include looking at the way negative price events affect MCL.

For any further enquiries, please email Prudentials@aemo.com.au.

Contents

Tables

Figures

1 Background

Clause 3.3 of the National Electricity Rules (NER) sets out the framework for the establishment and determination of the prudential settings for market participants in the NEM. AEMO's Credit Limit Procedures (CLP)[1] establish the methodology by which AEMO will determine the prudential settings for each Market Participant so that the prudential standard is met for the National Electricity Market (NEM). The first MCL review conducted in accordance with the CLP, was effective on 28 November 2013.

1.1 Credit Limit Procedures (CLP)

The CLP establish the methodology for determining the prudential settings and calculating the MCL, and hence credit support requirements for market participants, in a way that allows the 2% prudential standard to be met. The MCL for each market participant for each season is calculated according to the formula:

Maximum Credit Limit = Outstandings Limit + Prudential Margin

Where:

- Outstandings Limit (OSL) reflects the level of credit support needed to cover liabilities for all trading periods that have occurred but not yet been paid for, assuming no market participant is failing.
- Prudential Margin (PM) reflects the credit support buffer intended to cover accruing liabilities in the NEM during the reaction period (seven days), which relates to the time it may take to curtail any further liabilities accruing from a failing market participant.

The key features of the MCL calculation include:

- MCL typically[2] calculated over three seasons - summer, winter, and shoulder[3].
- Seasonal differences in regional reference prices (RRP) and price and load volatility in each region are accounted for through volatility factors (VFs).
- The relative risk of a market participant's energy profile is reflected using Participant Risk Adjustment Factors (PRAF) that express the relationship between regional load and a market participant's marginal loss factor (MLF) adjusted load.
- Changes in market participant MCL requirements are smoothed over corresponding seasons, with seasonal data considered as a continuous series, over the lifespan of the NEM.
- For each region, the level of volatility consistent with the prudential standard is calculated using historical regional load, RRP and relevant time period.

Further features of the CLP, together with the applicable prudential settings are summarised in Appendix 1.

[1] See https://www.aemo.com.au/-/media/files/electricity/nem/settlements_and_payments/prudentials/credit-limit-procedures.pdf?la=en

[2] In 2023, AEMO did not run the scheduled 'shoulder' MCL review due to the challenging market conditions, with participant MCL for the shoulder season being the same as for the winter season.

[3] Summer (December to March), winter (April to September), shoulder (October to November)

1.2 Prudential standard

A key aspect of the CLP is the prudential standard. The prudential standard set at 2% under clause 3.3.4A of the NER. In practical terms, this means the prudential arrangements establish a target of no payment shortfall in the market in 98 out of 100 instances of a market participant (e.g. a retailer) defaulting on their market payments, that is, the market participant exceeds their outstandings limit, subsequently defaults, and is removed from the market. In the remaining 2 of 100 instances, AEMO would hold insufficient prudential collateral, resulting in a payment shortfall to the remaining market participants who are net creditors in the market (considering both energy and reallocations).

1.3 Regional model recalibration

The regional model was recalibrated in mid-2023 to reflect market conditions more accurately, through an adjustment of the Volatility Factor (VF) percentiles. The VF percentiles are adjustable variables that can be used to recalibrate the regional model, with the aim of meeting the 2% prudential standard. The VF percentiles were set at 100% (the maximum) for all regions and have been used for the shoulder 2023 and summer 2024 MCL reviews. The previous and the recalibrated VF percentiles are shown in Table 2.

Table 1 Volatility factor percentiles

Region	Current VF percentiles	VF percentiles (2019 to mid-2023)
NSW	100.0%	99.8%
QLD	100.0%	100.0%
SA	100.0%	99.0%
TAS	100.0%	100.0%
VIC	100.0%	100.0%

1.4 CLP changes in 2023

In May 2023, AEMO completed the consultation on amendments to the CLP to allow reassessment of market participant prudential settings during extreme market conditions[4]. In August 2023, AEMO commenced further consultation on the CLP, in relation to:

- Terminology updates relating to the Nati*onal Electricity Amendment (Integrating energy storage systems into the NEM) Rule* 2021.
- Changes to include ancillary services payments and costs in prudential settings.
- Changes to improve prudential determinations for new participants with bidirectional energy flows.

This consultation is currently at the draft report stage and expected to be finalised in by early 2024[5].

[4] See consultation documents at: https://aemo.com.au/consultations/current-and-closed-consultations/credit-limit-procedures-reassessing-mcl-in-extreme-market-conditions

[5] See consultation document at: https://aemo.com.au/consultations/current-and-closed-consultations/credit-limit-procedures-iess-and-related-changes

2 Analysis

Under the NER, AEMO is required to annually review and publish its findings on the effectiveness of Credit Limit Procedures. The analysis period for this review encompassed data from 1 September 2022 to 31 August 2023, which included the 2022 shoulder, 2023 summer and the 2023 winter seasons. The review assessed whether:

- MCL levels were set appropriately.
- The prudential standard was met.

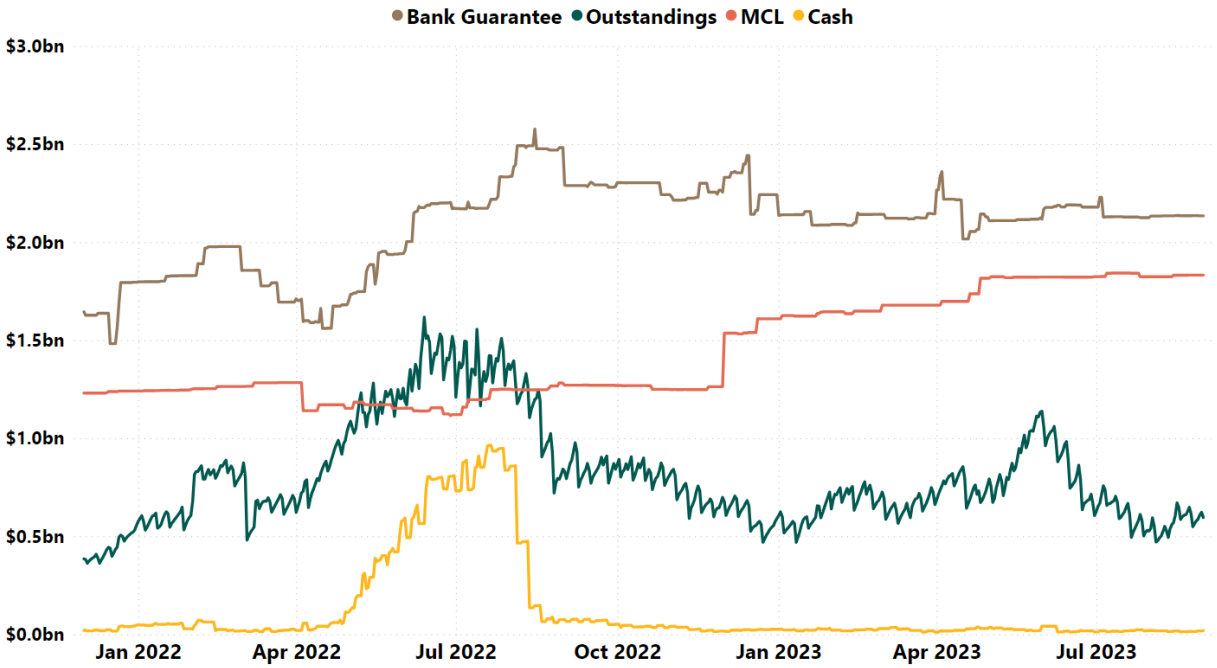
2.1 Setting of MCL levels

This analysis reviews key prudential indicators in aggregate for the market, including the minimum credit support requirements as calculated by AEMO (total MCL), the total participant outstandings, and the total bank guarantees and security deposits provided to AEMO by market participants. The analysis examines trends over both the short and long terms, the relationship between these indicators and what can be concluded about the effectiveness of prudential settings overall.

2.1.1 Short term prudential trends

Figure 1 shows the total MCL[6] and total outstandings[7] as well as total guarantees and security deposits provided by market participants over the past two and a half years.

Figure 1 Key prudential indicators (1 December 2020 to 31 August 2023)



[6] Sum of calculated MCLs for all market participants.

[7] Sum of outstandings for all market participants.

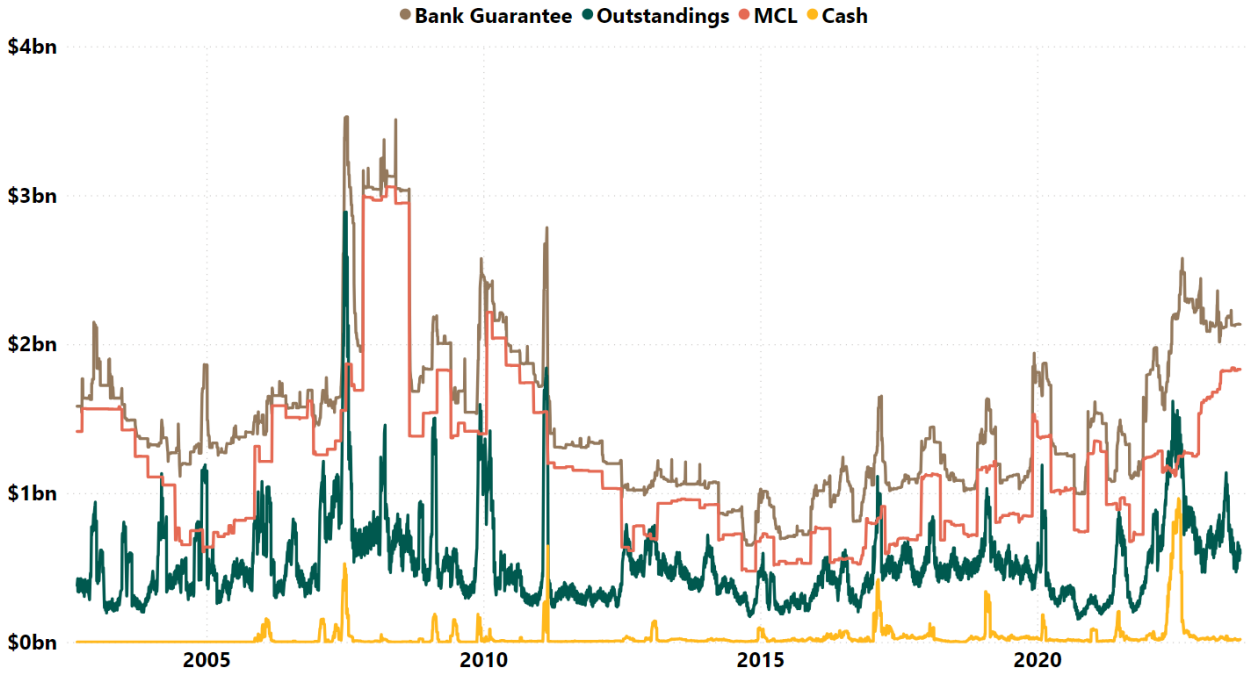
Key observations:

- **MCL exceedance** - there were no times during the analysis period where outstandings levels exceeded the MCL levels. This indicates that MCL levels were adequately set for all seasons during the analysis period.
- **Summer MCL** - total MCL levels for the 2023 summer season were somewhat higher (by $300 million) than the previous summer. Market participants provided additional guarantees above their MCL requirements, indicating that a perception t that additional prudential support would be needed or required.
- **Summer prudential risk** - from a prudential standpoint, the 2023 summer season was relatively uneventful, with only a small rise in outstandings over February, MCLs adequately covering outstandings and minimal use of security deposits.
- **Winter MCL** - total MCL levels for the 2023 winter season were substantially higher (by $600 million) than the previous winter. Market participants provided additional guarantees above their MCL requirements, indicating a perception that additional prudential support would be needed or required.
- **Winter prudential risk** - as has been the case since 2021, the outstandings levels in the 2023 winter season were significantly higher than summer season. This suggests that currently, winter is more likely to be the season for higher prudential risks. However in 2023, MCLs adequately covered outstandings with a small increase in use of security deposits.
- **Bank guarantees** – the total value of bank guarantees provided trended downwards over the analysis period from almost $2.5 billion in August 2022 to $2.1 billion in August 2023. This trend was the opposite to MCL levels, which went from $1.2 billion in August 2022 to $2.1 billion in August 2023.
- **Guarantees levels vs MCL requirements** - as has been the case for many years, guarantee levels were well above the MCL requirements. Notably, the gap between MCL and guarantees has been narrowing since its high point in August 2022, falling from a gap of $1.3 billion to $200 million in the year. This trend indicates that MCL levels are better aligned with actual market conditions and participants felt that they didn't need to provide as much additional credit support as in previous years.
- **Outstandings** - the highest outstandings over the analysis period occurred at the end of May 2022, with outstandings returning to the normal range in late June 2023.
- **Trading margin breaches** - there were relatively few trading margin breaches over the analysis period. Consistent with this, the use of security deposits fell dramatically in comparison to the 2022 winter season, with AEMO holding at most $40 million at any one time over the analysis period, compared to almost a billion dollars the previous year.
- **Negative prices** - recent market changes including shifts in the generation mix and the implementation of 5-minute settlements have been reflected by an increase in the frequency of trading intervals with negative prices. This has resulted in more renewable energy generators (usually with an MCL of zero) having trading margin breaches.

2.1.2 Long term prudential trends

Figure 2 looks at the levels of total MCL, guarantees, cash and outstandings over the entire life of the NEM.

Figure 2 Key prudential indicators (1999 to 2023)



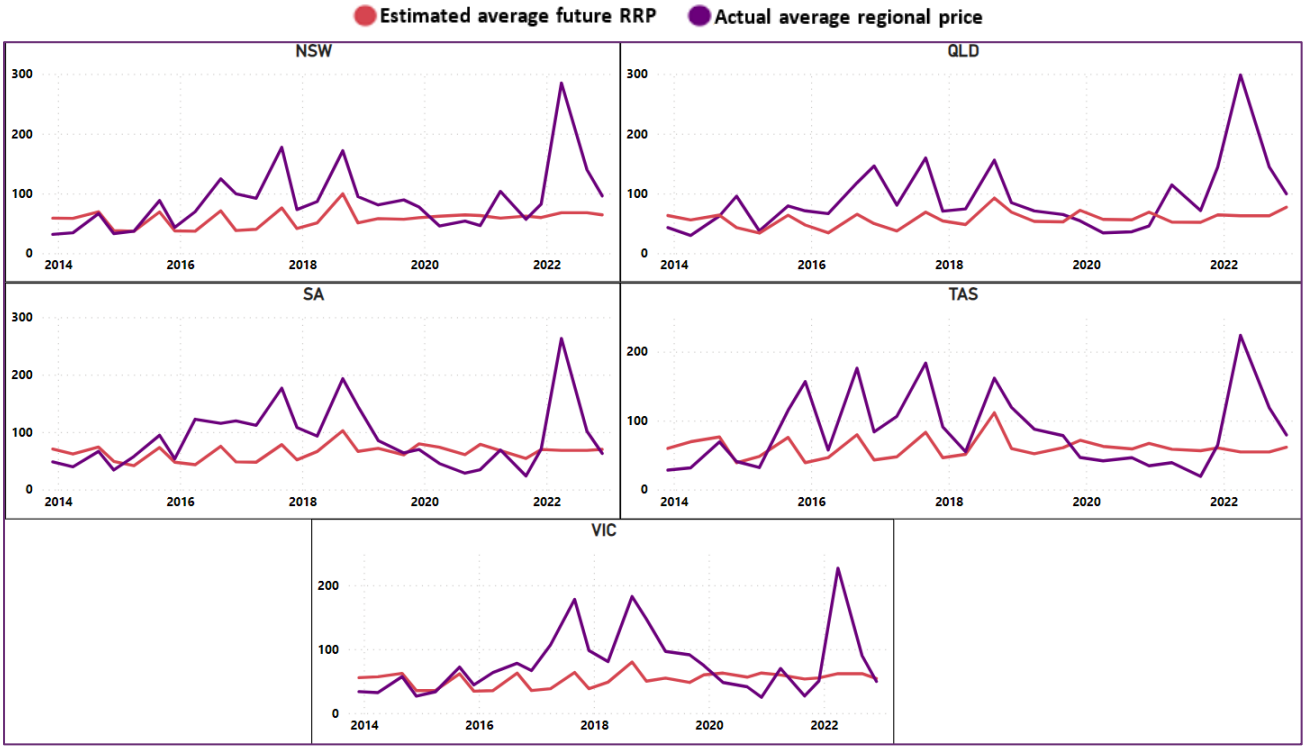
Key observations:

- **Participant behaviour** - the general behaviour of market participants in managing their prudentials has been fairly consistent over the years since the introduction of the CLP. The key behaviours are:
    - Provision of guarantees significantly above MCL levels for all seasons.
    - Using cash to manage periods of high outstandings.
- **Trends in prudential settings** – MCL and guarantee levels have increased to their highest levels since 2011. The outstandings levels in the winter seasons were significantly higher than summer seasons in each of 2021, 2022 and 2023. This suggests that, increasingly, winter is the season with higher prudential risks.
- **Trends in outstandings** - outstandings reached their highest level under the CLP between May and August 2022, with a peak of approximately $1.6 billion on 13 June 2022. They have since moderated but, on average, outstandings are still higher than they have been over the past 10 years.
- **MCL vs outstandings** - MCL levels have been changing at a slower rate than outstandings. This is due to the design of the CLP which aims to shield market participant's MCLs from one-off changes to prices and volatility, whilst enabling them to respond to longer-term trends. There have been only a few occasions where total MCL was below outstandings; in winter 2016, summer 2017 and winter 2022.

2.1.3 Estimated average future RRP vs actual average prices

Figure 3 shows the estimated average future RRP (used in MCL calculations) in comparison to actual prices over MCL seasons, during the past 10 years. As shown, estimated average future RRPs are steady and slowly changing over time (as is the intention under the CLP methodology), while actual prices exhibit volatility over various MCL seasons.

Figure 3 Estimated average future RRP compared to actual prices (2014 to 2023)



Key observations:

- **Actual price trends** - in all regions, actual prices were at a low point in 2014 and early 2015, started to trend up from mid-2015 and continued to climb until 2019. After 2019, actual prices remained moderate, except for the price spikes in NSW and QLD between May and July 2021. Actual prices increased dramatically in all regions in 2022, beyond all previously seen price spikes. They have since moderated returning to be in line with long term averages.
- **Estimated average future RRP trends** - estimated average future RRP movements lag behind actual price changes in all regions under the current CLP price forecasting methodology. The methodology in the CLP has been designed to smooth changes in market participants' MCLs resulting from one-off changes to estimated average future RRP and volatility from one season to the corresponding season in the following year, while responding to longer-term trend changes. This, in practical terms, has meant that the regional model[8] is slow to respond to price rises and it takes significant time for estimated average future RRP to "catch-up" with step changes in actual prices. This limitation in the CLP resulted in a mismatch between the estimated average future RRP and actual prices over the 2022 winter season.

[8] The regional model is used by AEMO to estimate the average future RRP and volatilities based on past NEM data.

- **Actual prices vs estimated average future RRP** - since 2016, average actual prices have constantly been higher than the estimated average future RRP in most years. This was especially acute over winter 2022, when actual prices were 2 to 3 times higher than the estimated average future RRP in all regions. This discrepancy has since moderated, with average prices above estimated average future RRPs in NSW, QLD and TAS and below estimated average future RRPs for the SA and VIC regions over the analysis period.

2.2 Meeting the prudential standard

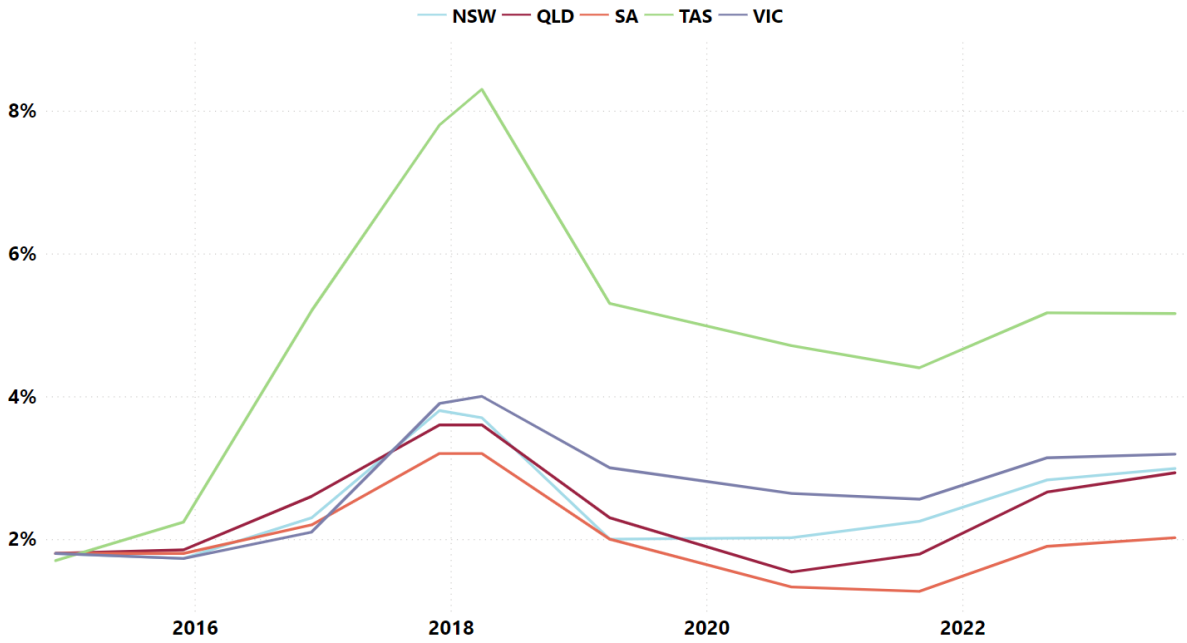
The prudential standard is the value of the prudential probability of exceedance (POE), expressed as a percentage and is set at 2% (NER 3.3.4A). It is a theoretical calculation which does not consider AEMO's responsive prudentials processes or the significant level of credit support provided by participants in addition to their MCL requirements.

Exceeding the prudential standard does not mean that there is a payment shortfall in any given year. The purpose of the prudential standard is to provide a target within which AEMO seeks to maintain the risk of loss in the event of market participant default. The POE over the past 7 years, for each NEM region is shown Table 1. The changes in POE since the start of the CLP are shown in Figure 4. As shown, at the end of the current analysis period (31 August 2023), the prudential standard was exceeded in all regions except SA.

Table 2 POE for the past 7 years

Prudential data used	NSW	QLD	SA	TAS	VIC
To 30 November 2017	3.8%	3.6%	3.2%	7.8%	3.9%
To 31 March 2018	3.7%	3.6%	3.2%	8.3%	4.0%
To 31 March 2019	2.0%	2.3%	2.0%	5.3%	3.0%
To 31 August 2020	2.0%	1.5%	1.3%	4.7%	2.6%
To 31 August 2021	2.3%	1.8%	1.3%	4.4%	2.6%
To 31 August 2022	2.8%	2.7%	1.9%	5.2%	3.1%
To 31 August 2023	3.0%	2.9%	2.0%	5.2%	3.2%

Figure 4 Changes in POE over time



Key observations:

- **Timing of POE exceedance** - while the POE increased slightly in all regions except TAS over the analysis period, these increases were almost exclusively driven by prudential exceedances[9] from September to November 2022, a period of time following the extreme market conditions of winter 2022, when prices were still high and MCLs were low. There were no prudential exceedances at all over the 2023 summer season and only a handful in May 2023. There were no further prudential exceedances over the winter season till the end of August 2023.
- **POE trends** - POE increased in all regions from 2016, plateauing out over 2017/2018. This was followed by a downward trend to 2021, with POE returning to be near the 2% target in most regions (except TAS[10]). There was again an uplift in the POE for all regions in 2022, due to the high price events in winter 2022. The POE has remained at that heightened level into 2023. As the POE calculation is additive, the increases from 2022 continue to be included in the calculation. It will therefore take many years of low prudential exceedance levels for the POEs to reduce to below 2022 levels.
- **POE in the future** - AEMO cannot recalibrate the regional mode any further to reach the 2% target, with the VF percentiles already set to the maximum in all regions (see Section 1.3). However, with higher estimated average future RRPs (especially over winter seasons) flowing through to MCL calculations, AEMO expects the POE in all regions to fall over the next few years. However, due to the prudential exceedances already included in the POE calculation, unless changes are made to the way MCLs are calculated and/or the regional model, AEMO does not anticipate the POEs will return to 2% in the NSW, QLD, VIC and TAS regions in the near future.

[9] A prudential exceedance is a day when a market participant's MCL is exceeded by its outstandings at the end of the reaction period following the Market Participant exceeding its OSL on any day and failing to rectify this breach.

[10] The TAS region joined the NEM in 2006 (1999 for all other regions), resulting in a smaller data set being available to use in the regional model, and making it harder for the prudential standard to be met. This, together with the Basslink outage in 2016, is why the prudential standard has not been met in the region over the past 5 years, even with the VF percentile set at 100%. AEMO's previous analysis (2017 CLP Effectiveness Review) indicates that if the effect of the 2016 Basslink outage is excluded, the 2% prudential standard could be reached.

- **Implications of not meeting the prudential standard** - the POE is calculated over the life of NEM. Thus, exceeding the 2% prudential standard indicates a higher risk of payment shortfall overall, but it does not indicate a payment shortfall in any given year. Despite exceeding the prudential standard, there were no payment shortfalls over the analysis period.
- **Improvements to align with the prudential standard** - it is more likely that the prudential standard will not be met when actual market conditions do not align with participants' prudential requirements. At such times (i.e. winter 2022), prudential risks are significantly mitigated by AEMO's highly responsive operational processes that minimise, in close to real time, the risk of market settlement payment shortfalls. Additionally, AEMO continues to improve its prudential processes and the way it manages new and existing challenges in the market. In May 2023, AEMO implemented changes to the CLP to allow for the reassessment of market participant prudential settings during extreme market conditions. This change will ensure that in the future, MCLs are better aligned with actual market conditions, and extreme events such as winter 2022 are unlikely to result in large POE increases.

2.3 Conclusions

The 2023 review of the CLP has found the following:

Short term prudential trends

MCLs were set at a sufficient level for the summer, winter and shoulder seasons in the analysis period, with reasonable alignment between MCLs and actual market conditions in all regions. Participants continued to provide additional bank guarantees above the MCL requirements, however the gap between the two has narrowed indicating that overall, market participants believed MCLs were better aligned with outstandings than has been the case over the past few years. There was minimal use of security deposits with higher MCLs and relatively benign market conditions negating the need for additional prudential coverage.

Long term prudential trends

MCL and guarantee levels have increased to their highest levels since 2011. Conversely, outstandings have moderated since the highs of winter 2022, but on average, outstandings are still higher than they have been over the past 10 years. The outstandings levels in the winter seasons were significantly higher than summer seasons in 2021, 2022 and 2023, suggesting that increasingly winter is the season with higher prudential risks.

Price trends

The discrepancy between estimated average future regional RRP used in MCL calculations, and actual prices has moderated over the analysis period, with actual prices somewhat above estimated average future RRP in NSW, QLD and TAS and below estimated average future RRP for the SA and VIC regions. This is in contrast to winter 2022, when actual prices were two to three times higher than the estimated average future RRPs in all regions.

Meeting the prudential standard

The prudential standard was exceeded in the NSW region at 3.0%, in the QLD region at 2.9%, in the VIC region at 3.2% and in the TAS region at 5.2%. These prudential exceedance values were almost unchanged from the previous year. Despite the prudential standard being so exceeded, there were no payment shortfalls over the analysis period.

3 Intended actions

The prudential standard currently being exceeded in most regions is not an artefact of the mismatch between estimated average future RRPs used in MCL calculations and actual prices, as has been the case in previous years. Rather, the cause is the additive nature of the POE calculation, and the level of prudential exceedances already included in the POE from prior years.

With the VF percentiles for all regions set at 100%, AEMO currently has limited options for adjusting the regional model and/or the MCL calculations to meet the prudential standard. AEMO will continue to explore additional ways the Rules, regional model and/or the CLP could be updated to ensure MCLs are set appropriately and that the prudential standard is met in the future.

One such likely improvement over 2024, is the updating of the MCL calculation for participants who consistently generate during negative price events, to ensure that prudential risks are adequately assessed under all conditions.

A1. Key CLP features and relevant data

Table 3 CLP key features

Feature	Description/value
Definition of standard	Prudential Probability of Exceedance (POE)
Relevant time period for MCL	42 days (35 days outstanding period plus 7 days reaction period)
Measure of standard	2% POE target
MCL	MCL = Outstandings Limit + Prudential Margin
Basis of OSL and PM	Price x load x volatility OSL x 35 days Price x load x volatility PM x 7 days
Variance of MCL over the year	By season
Regions	MCL calculations are regionally based (NSW, QLD, SA, TAS & VIC)
Regional Reference price (RRP) used	Average price from NEM start for applicable season in each region
Volatility Factors (VF)	Volatility factor from NEM start for applicable season in each region
Volatility Factor percentiles	Calculated to meet the 2% prudential standard
Participant differentiation	Participants differentiated by load factor and load profile
PRAF	Express the relationship between regional load/generation/reallocations and the market participant's marginal loss factor (MLF) adjusted load/generation/reallocations.
Weighting factor – average regional load	70%
Weighting factor – average regional price	20%
Weighting factor – volatility factors	20%

The current prudential settings are described in Table 4 to Table 6. They specify the forecast volatility factors and average prices calculated for input to the prudential settings calculations for the 2023 winter, 2023 shoulder and the 2024 summer seasons.

Table 4 Outstandings Limit Volatility Factor (VFOSLR)

Region	Winter 2023	Shoulder 2023	Summer 2024
NSW	1.53	1.3	1.51
QLD	1.55	1.39	1.52
SA	1.57	1.44	1.77
TAS	1.61	1.52	1.42
VIC	1.58	1.38	1.63

Table 5 Prudential Margin Volatility Factor (VFPMR)

Region	Winter 2023	Shoulder 2023	Summer 2024
NSW	2.25	1.83	2.89
QLD	2.19	1.88	2.86
SA	2.29	2.05	4.29
TAS	2.23	1.88	1.65
VIC	2.26	1.73	3.69

Table 6 Average Price (PR) - $/MWh

Region	Winter 2023	Shoulder 2023	Summer 2024
NSW	$67.70	$67.70	$64.23
QLD	$62.61	$62.61	$77.03
SA	$68.08	$68.08	$69.90
TAS	$54.47	$54.47	$61.23
VIC	$61.73	$61.73	$54.20

Table 7 specifies the regional Volatility Factor Percentiles consistent with the prudential standard as calculated for input to the prudential settings calculations.

Table 7 Volatility Factor Percentiles

Region	Volatility Factor Percentile
NSW	100%
QLD	100%
SA	100%
TAS	100%
VIC	100%

A2. Glossary

This document uses many terms that are defined in the National Electricity Rules (NER). These terms have the same meaning in this report unless otherwise specified.

In addition, the words, phrases and abbreviations in the table below have the meanings set out opposite them when used in this report.

Term	Definition
CLP	credit limit procedures
MCL	maximum credit limit
NEM	National Electricity Market
NER	National Electricity Rules
OSL	outstandings limit
PM	prudential margin
POE	prudential probability of exceedance
VF	volatility factor