



REPORT: EFFECTIVENESS OF THE NEM PRUDENTIAL SETTINGS METHODOLOGY

15 December 2021

Credit Limit Procedures

A report for the National Electricity Market

Important notice

PURPOSE

AEMO has prepared this document to provide information about the effectiveness of the methodology used to determine the prudential settings for Market Participants, as at the date of publication.

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VERSION CONTROL

Version	Release date	Changes
1	15/12/2021	Final Report

Executive summary

Under the National Electricity Rules (NER) clause 3.3.8(f), AEMO is required to annually review and publish its findings on the effectiveness of National Electricity Market (NEM) Prudential Settings Methodology. The 2021 review analysed prudentials data from 1 September 2020 to 31 August 2021, assessing whether:

- Maximum Credit Limits (MCL) were set appropriately.
- The prudential standard was met.

The 2021 review found that MCLs were set sufficiently for the analysis period, with MCL levels in line with prevailing market conditions. Correspondingly, the 2% prudential standard was met in the Queensland and South Australian regions. The prudential standard was exceeded slightly in the New South Wales region at 2.3% and the Victorian region at 2.5%, and was above the prudential standard in Tasmania at 4.4%.

While the prudential standard was exceeded in some regions, it is important to note that there was no payment shortfall in the market, and AEMO was not in breach of the rules. The exceedance calculation is theoretical only and does not consider the actual total credit support provided by market participants. Furthermore, the 2% prudential standard represents a prospective target, rather than a prescribed requirement.

Changes to the Credit Limit Procedures (CLP), implemented from 2017 to 2019, have resulted in MCL requirements being more aligned with actual market conditions than they were previously. Underscoring the appropriateness of these changes, all regions expressed a downward trend in prudential exceedance over the past years. AEMO expects that going forward, the prudential exceedance for all regions, with perhaps the exception of Tasmania, will be in line with the 2% prudential standard.

As the prudential standard is currently met or close to being met in most regions and MCL levels are believed to reflect actual market conditions, AEMO does not foresee the need for further changes to the CLP as an outcome of this review. In accordance with the clause 11.1 in the CLP, AEMO conducts a review on adjustment factors used in the MCL calculation once every 3 years. The next review is scheduled in 2022 and these factors will be adjusted if required.

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

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1. Background

The New Prudential Standard and Framework sits under Clause 3.3 of the NER. Its key features are outlined in AEMO's Credit Limit Procedures (CLP)¹. The first MCL review conducted in accordance with the new Framework, was effective on 28 November 2013.

1.1 Credit Limit Procedures

The CLP² 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 participant for each season is calculated according to the formula:

$$\text{Maximum Credit Limit} = \text{Outstandings Limit} + \text{Prudential Margin}$$

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 calculated over three seasons - summer, winter, and shoulder³.
- 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 participants energy profile is reflected through the use of 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.

1.2 Prudential standard

A key aspect of the CLP is the prudential standard. The prudential standard set at 2% under NER clause 3.3.4A. 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 retailer defaulting on their market payments, that is, the retailer exceeds their outstandings limit, subsequently defaults, and is removed from the market. In the remaining two 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 See https://www.aemo.com.au/-/media/files/electricity/nem/settlements_and_payments/prudentials/credit-limit-procedures.pdf?la=en

² See https://www.aemo.com.au/-/media/files/electricity/nem/settlements_and_payments/prudentials/credit-limit-procedures.pdf?la=en

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

1.3 CLP Changes and Implementation in 2020/2021

In 2019, AEMO completed a consultation⁴ to amend the CLP to support the implementation of the Five-Minute Settlement Rule, in addition to simplifying the season definitions (removal of the shoulder 1 season). The updated procedures have been effective since 3 December 2019. The shoulder 1 season was removed and the winter season was extended from 2020 (effective on 1 April 2020). The Five-Minute settlement rule change was implemented in the regional calculation commencing from the 2021 shoulder season (effective on 1 September 2021).

In 2020, AEMO amended the CLP again through another consultation⁵ to support the implementation of the Wholesale Demand Response (WDR) Mechanism. This is the latest version of the procedures and it became effective on 19 January 2021. The WDR changes were implemented commensurate with market go-live on 24 October 2021.

In 2021, the AEMC made a rule change to enable the NEM to support the ongoing settlement of system support transactions in low, zero and negative demand conditions. This rule change commenced on 1 September 2021. While the Rule change does not directly impact the CLP or prudential processes, market trends such as low demand and negative prices may present additional prudential risks, the implications of which AEMO must consider.

⁴ For consultation documents, please see: <https://www.aemo.com.au/Stakeholder-Consultation/Consultations/Five-Minute-Settlement---Credit-Limit-Procedures?Convenor=AEMO%20NEM>

⁵ For consultation documents, please see: <https://aemo.com.au/consultations/current-and-closed-consultations/credit-limit-procedures-wdrm>

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 2020 to 31 August 2021, including the 2020 shoulder, 2021 summer and the 2021 winter seasons. The review assessed whether:

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

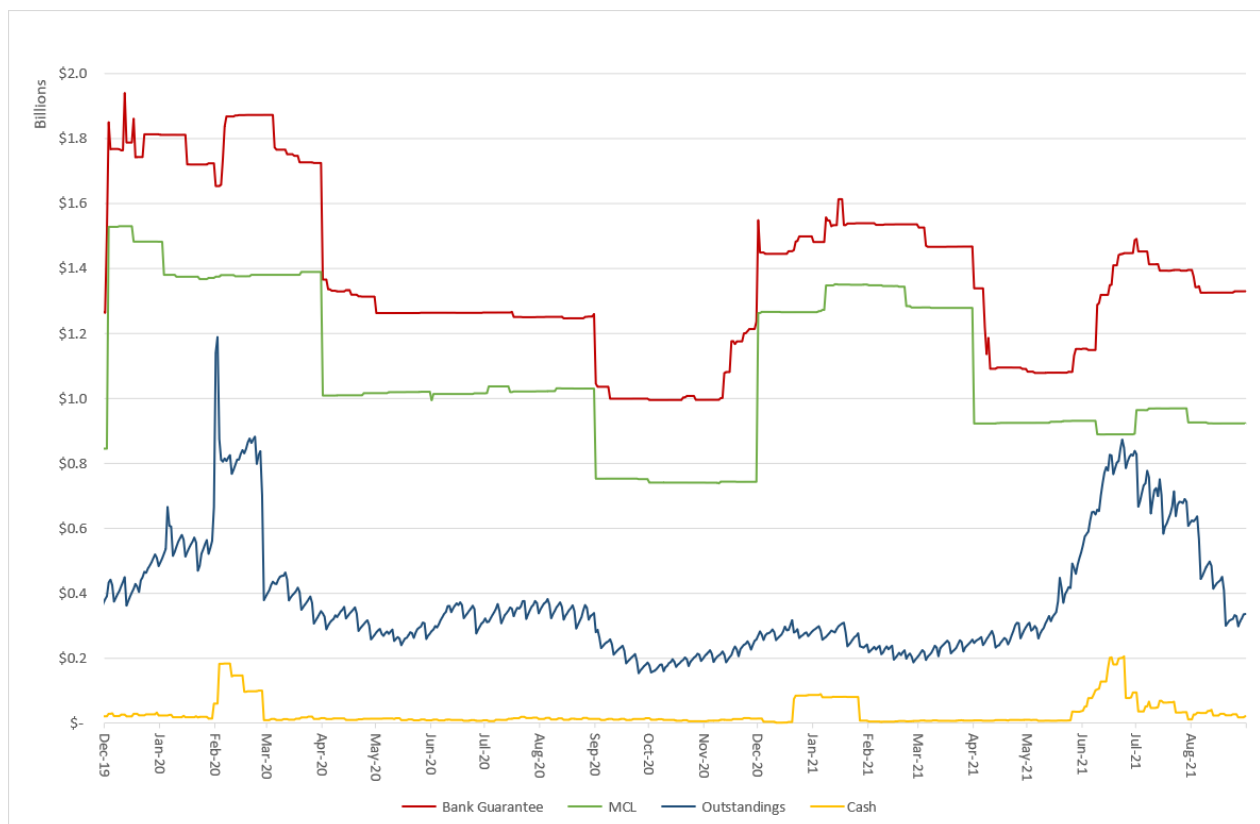
2.1 Setting of MCL levels

This analysis reviews key prudential indicators in aggregate for the market, including the minimum collateral requirements as calculated by AEMO (total MCL), the total outstandings in addition to the amount of bank guarantees, and cash provided to AEMO by market participants. The analysis examines trends over both the short and long term and the relationship between these indicators and what can be deduced about the effectiveness of prudential settings overall.

2.1.1 Short term prudential trends

Figure 1 shows the total MCL⁶ and total outstandings⁷ as well as total guarantees and cash (security deposits) provided by market participants over a 21 month time period.

Figure 1 Key prudential indicators (1 December 2019 – 31 August 2021)



⁶ Sum of calculated MCLs for all market participants.

⁷ Sum of outstandings for all market participants.

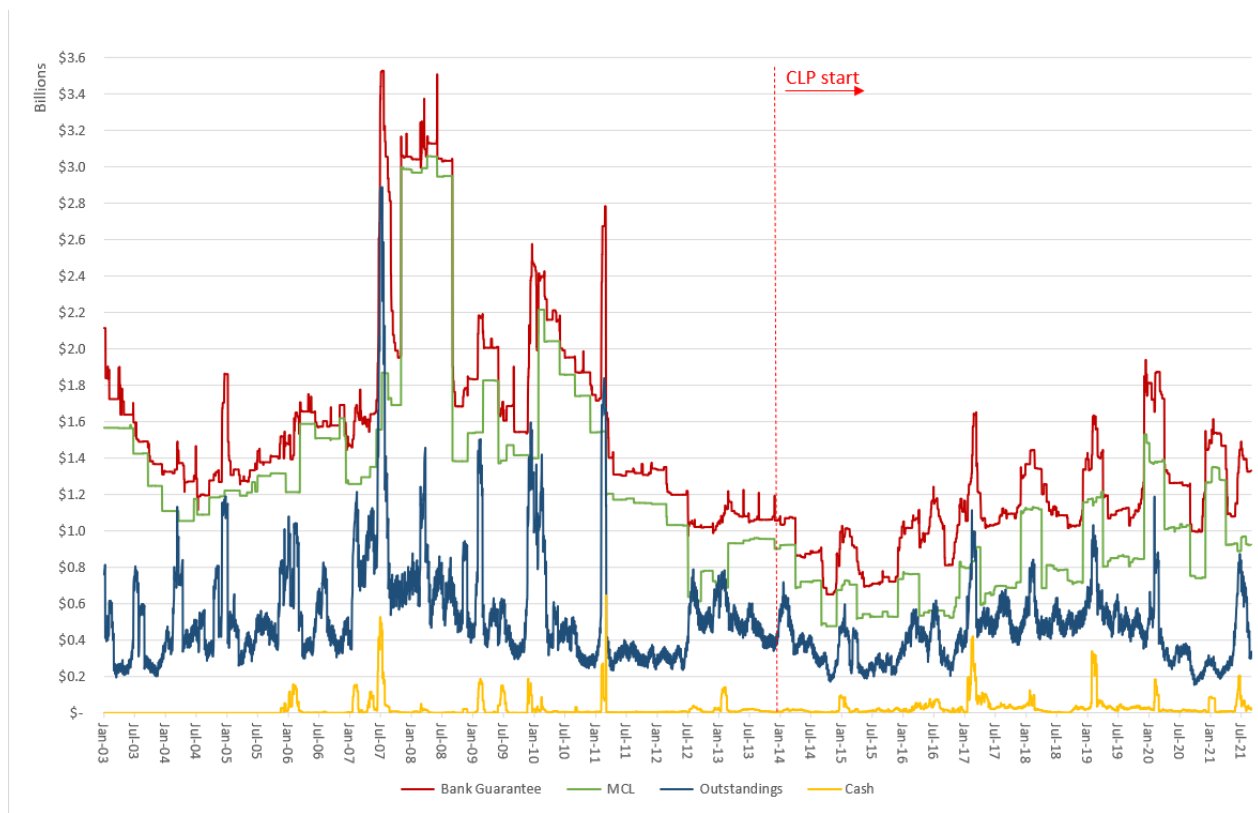
Key observations:

- There were no time periods where total outstandings were above total MCL levels. This indicates that broadly speaking, MCL levels were set sufficiently for the time period for all three seasons. In prior years, there were multiple time periods where outstandings were above MCL levels, usually indicating that MCL levels were set too low in comparison to prevailing market conditions.
- Guarantees levels, as has been the case for many years, were well above the MCL requirements. The total outstandings spiked after the QLD power outage event in May 2021 and almost exceeded the total MCL levels. Market participants proactively managed this situation by providing additional guarantees and cash between May and July 2021.
- Outstandings levels have been flat and low over the entire year from April 2020 to April 2021, even during the summer season, staying below \$400 million. As MCL levels were comparatively high during this period, there was a lower need for ad-hoc management for participant outstandings. This is evidenced by the low amount of security deposits supplied (except over the Christmas and New year period in 2020/2021).
- Between the Christmas week of 2020 and the Australia Day 2021, security deposit amounts increased significantly. The provision of most of these security deposits was voluntary, that is, market participants were taking proactive action to protect themselves from unforeseen circumstances and market uncertainties for the first summer since the start of the Covid-19 pandemic. AEMO believes market participants are more cautious and attentive to their prudential positions since the start of the pandemic, especially in relation to their accessibility to cash and bank guarantees.
- The total MCL levels for the 2021 summer season were slightly lower than for the previous summer. The outstandings were however significantly and unusually lower than the previous summer, due to the warm but much wetter weather. Market participants continued to provide additional guarantees above their MCL requirements, though the extra amount provided was not as significant as during the 2020 summer. This indicates that participants anticipated the need for additional prudential support for the 2021 summer period.
- Despite much lower outstandings levels in 2021 summer, the bank guarantee levels remained higher than the MCLs throughout the whole season. Participants did not adjust their guarantee amounts according to the lower outstandings levels, partially due to the inconveniences in providing or exchanging paper guarantees during the Covid-19 pandemic period.
- 2021 was the second year in which the month of April had moved from being a separate shoulder season (previously referred to as shoulder 1) to be part of the winter season (resulting in three MCL review periods per year versus four). There was no obvious resulting change to market participant behaviour, likely due to the fact that changing MCL requirements for one month is insignificant from an overall market trends perspective. However, the removal of the shoulder 1 season has resulted in a moderate reduction of administrative effort for both AEMO and market participants.
- The effects in the prudentials space from the implementation of 5-minutes settlement and the wholesale demand response mechanism are yet to be observed, and will be discussed in the next annual report.

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 (Life of NEM)



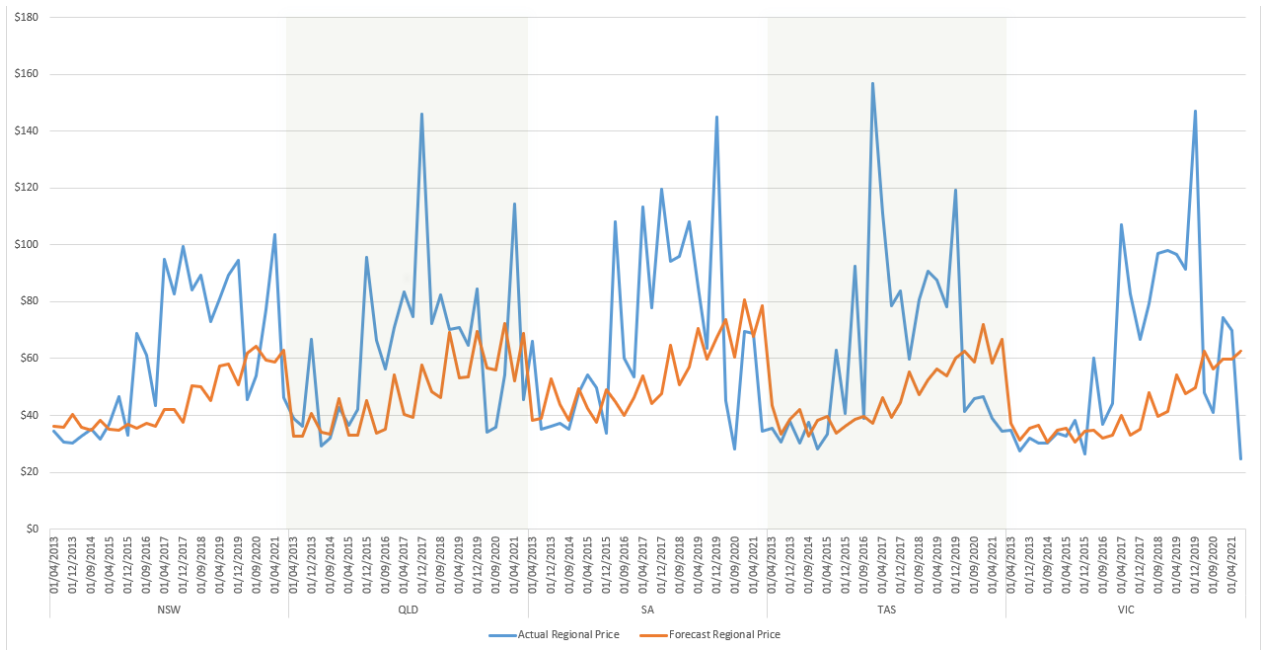
Key observations:

- 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:
 - Providing guarantees significantly above MCL levels for all seasons.
 - Using cash to manage periods of high outstandings.
- Outstandings had a step increase from late 2016 onwards, due to price and volatility increases in all regions until 2020. MCL levels have been increasing at a slower rate, due to the design of the CLP which aims to smooth changes in MCLs resulting from one-off changes to prices and volatility, while responding to longer-term trend changes.
- The period from January 2017 to March 2020 has seen a very similar level of outstandings sitting between \$0.4-\$0.6 billion with peaks of between \$1.0 to \$1.2 billion over the summer periods.
- The year 2021 saw both an unusual summer and winter seasons from a total outstandings perspective, with low outstandings in summer (\$0.2-\$0.3 billion) and high outstandings (approaching \$0.9 billion) in winter. This unusual outcome was mainly due to mild summer conditions and a QLD power outage event in winter.
- Market participants readily use security deposits during periods of high outstandings (usually due to transient high prices, such as the first two months in each year and winter in 2021).
- The outstandings level reached the peak in early 2020 then started to trend down (except the spike in 2021 winter due to the QLD power outage). It has returned to a level similar to the low point at the start of the CLP in 2014/2015. This is the result of a combination of factors, including the effects of Covid-19 on the electricity market, lower demand and negative prices. It remains to be seen whether this trend continues into the future.

- The MCL is designed to cover market participant prudential exposure under normal market conditions in the medium to long term. Additionally, cash can be used by market participants as short-term prudential coverage when unexpected market events cause price spikes. If there is a long-term trend of price and/or volatility reduction due to lower demand and negative prices, the cumulative effect of this trend will result in decreasing MCL levels in the near future.
- If MCL requirements continue to decrease and market participants reduce the amount of additional credit support they provide in the form of guarantees, the market might require an increasing amount of cash provision to manage high price events. Under such a scenario, some market participants may face greater challenges to their cashflow, and the risk of shortfall overall may increase. As an example, during the power outage in QLD in May 2021, outstanding levels increased from \$300 million to \$850 million (an increase of \$550 million) within a month. As relatively high MCL requirements were in place at that time, the market only needed to provide around \$200 million cash in total to avoid a shortfall. If a similar event occurred at a time with lower MCL levels and thus lower levels of credit support held by AEMO, market participants would need to come up with a much larger amount of cash, potentially increasing default risks.
- In 2022, AEMO will review its prudential processes to determine if there are any additional prudential risks emerging due to market trends such as low demand and negative prices. Any changes to relevant procedures and/or the Regional Model that AEMO thinks may be required as an outcome of this review will be presented to market participants, and undergo consultation as required under the Rules.

Figure 3 compares the regional forecast prices to the actual prices in all regions since the introduction of the CLP.

Figure 3 Regional forecast prices compare to actual prices (2013-2021)



Key observations:

- 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 (2021 winter season). These price spikes were due to a power outage event in QLD in late May 2021. As a result, the amount of cash held by AEMO increased by

more than 50% to maintain market participant prudential positions compared to the same season in 2020.

- Forecast prices were low and flat from 2014 to 2016. They started to trend up, following actual prices in 2016/2017 and continue climbing until they peaked in 2020. However, these prices were lagging significantly behind actual prices from 2015 to 2019 in all regions. The CLP has been designed to smooth changes in market participants required MCLs from one season to the corresponding season in the following year resulting from one-off changes to average regional prices and volatility, while responding to longer-term trend changes. This, in practical terms, has meant that the regional model is slow to respond to price rises and it has taken significant time for forecast prices to “catch-up” with the step change in prices that occurred between 2016 and 2018.
- After the series of changes made in the CLP and AEMO’s regional model since 2017, forecast prices in all regions are now aligned with or are somewhat higher (i.e. in Tasmania) than actual prices.

2.2 Meeting the prudential standard

2.2.1 Regional model recalibration

The regional model was recalibrated in 2019 through the adjustment of the Volatility Factor (VF) percentiles to more accurately reflect current market conditions.

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 recalibrated VF percentiles adjusted to meet the 2% prudential standard, and currently used in the regional model are shown in Table 1.

The next scheduled recalibration of AEMO’s regional model will be in 2022.

Table 1 Volatility factor percentiles

Region	VF percentiles
NSW	99.8%
QLD	100.0%
SA	99.0%
TAS	100.0%
VIC	100.0%

2.2.2 Prudential probability of exceedance

The prudential standard is the value of the prudential probability of exceedance (POE), expressed as a percentage and is set at 2% (NER clause 3.3.4A). Exceeding the prudential standard does not mean that there is a 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 5 years, for each NEM region is shown Table 2. The changes in POE since the start of the CLP are shown in Figure 4.

As shown below, at the end of the current analysis period (31 August 2021), the prudential standard is met in the QLD and SA regions. The prudential standard is still exceeded in the TAS, VIC and NSW regions, being 4.4%, 2.6% and 2.3% respectively. Despite this exceedance, the POE has been on a downward trend for all regions since 2017/2018 except the increased POEs in QLD and NSW regions in 2021 after the QLD power outage event. This indicates the measures taken by AEMO to recalibrate and adjust the regional model over the past few years have worked as intended.

While Victoria’s POE has been above 2% for the past 5 years it is decreasing and is currently at 2.6% which is only marginally above the prudential standard. The New South Wales’ POE stayed at 2% since 2019 and slightly over 2% in 2021 after the QLD power outage event. The high POE for Tasmania doesn’t represent

additional prudential risk, rather is an artefact of the modelling due to a smaller data set being available for the region and the 2016 Basslink outage⁸.

The POE for QLD and SA has been marginally lower than the 2% prudential standard for the last two years. This indicates that the volatility factors for these regions may need to be recalibrated. The recalibration of the VF percentiles to align with the 2% prudential standard will occur during the next CLP review in 2022. The VF percentiles for the other regions will likely stay at their current levels.

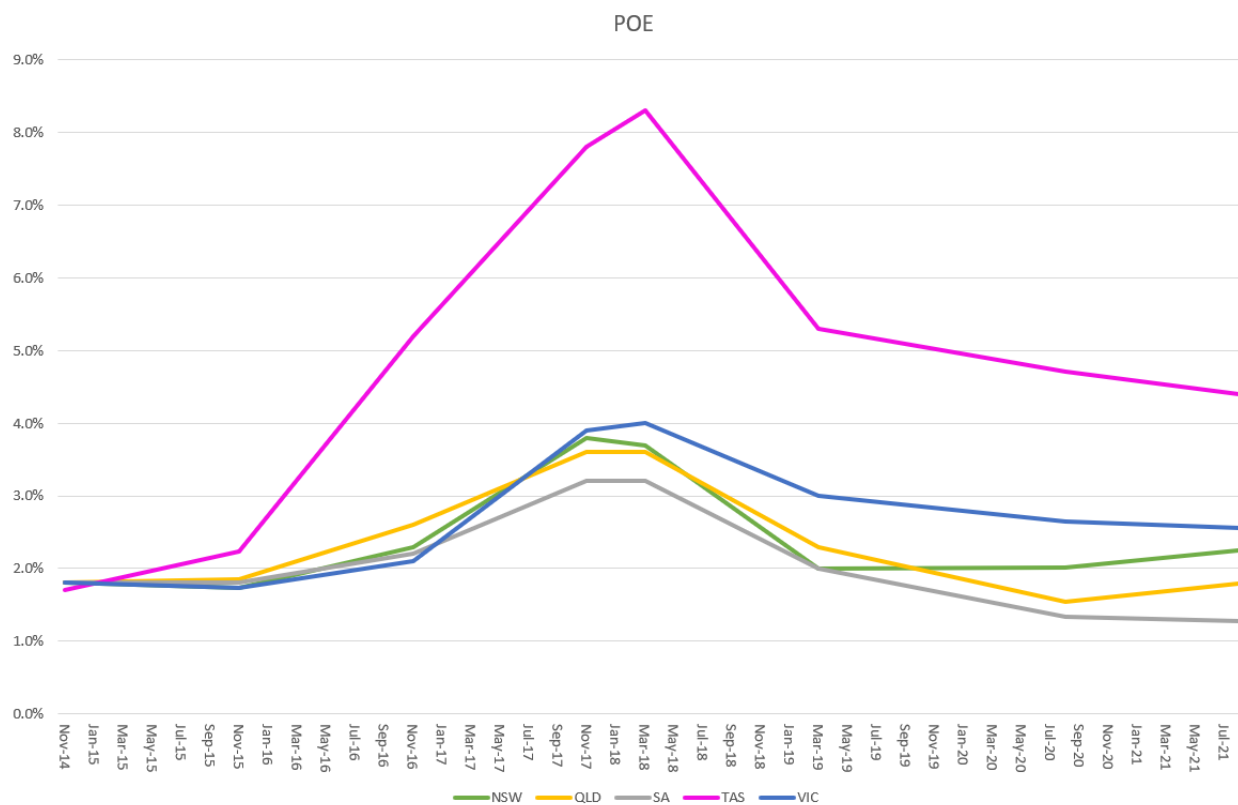
It is important to note that despite the prudential standard not being met in some regions, there were no payment shortfalls in the NEM. In times of high outstandings, AEMO has highly responsive operational processes that mitigate, in close to real time, the risk of a payment shortfall. These processes, together with the additional credit support provided by participants above their MCL requirements, are not considered as part of the prudential POE calculations.

Table 2 POE for the past 5 years

	Prudential data to 30 November 2017	Prudential data to 31 March 2018	Prudential data to 31 March 2019	Prudential data to 31 August 2020	Prudential data to 31 August 2021
NSW	3.8%	3.7%	2.0%	2.0%	2.3%
QLD	3.6%	3.6%	2.3%	1.5%	1.8%
SA	3.2%	3.2%	2.0%	1.3%	1.3%
TAS	7.8%	8.3%	5.3%	4.7%	4.4%
VIC	3.9%	4.0%	3.0%	2.6%	2.6%

Figure 4 Changes in POE over time

⁸ 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.



Key observations:

- There was an uplift in POE for all regions since 2016, plateauing out over 2017/2018 and then falling from 2018/2019.
- Correspondingly, the 2% prudential standard was met in the QLD and SA regions. The prudential standard was exceeded slightly in the New South Wales region at 2.3% and the Victorian region at 2.6%, and was above the prudential standard in Tasmania at 4.4%.
- For all regions, the POE currently is much better aligned with the prudential standard than has been the case between 2016 and 2019. This is due to higher overall MCL levels, better reflecting actual market conditions and less volatility in the market as well as the effects of the changes to AEMO’s regional model (as described above).
- Changes to the CLP over the past few years, together with the recalibration and modelling adjustments, have resulted in prudential requirements being significantly better aligned with actual market conditions than they were over the 2016 to 2019 time period.
- AEMO expects that going forward, prudential exceedances for all regions except Tasmania, will remain at or in Victoria’s case return to more historic levels and be in line with the 2% prudential standard.
- In comparison to the current analysis period, the POE exceeded the prudential standard for all regions between 2016 to 2018. There was a particularly large jump in POE in 2017 and 2018. The reason for this was a step increase in prices and volatility which were not fully incorporated into AEMO regional model due to its design limitations, leading to MCL levels that were too low compared to market conditions.

2.3 Conclusions

MCL levels

- Broadly speaking, MCLs were set at a sufficient level for the analysis period, with MCL levels in line with prevailing market conditions.

- Changes to the CLP, implemented over the past few years, have resulted in prudential requirements being significantly better aligned with actual market conditions than they were previously.
- Market participants continued to provide credit support above their MCL requirements to proactively manage trading limits during high priced/volatile periods as well as using security deposits on an ad-hoc basis. Participants maintained a more-than-sufficient security deposit level in the first Christmas/New year period after the pandemic started.
- There was no resulting obvious change to market participant behaviour from the removal of shoulder 1 season. The change did result in a moderate reduction of administrative effort for both AEMO and market participants
- Any effects in the prudentials space from the implementation of 5-minutes settlement and the wholesale demand response mechanism are yet to be observed.
- There is a potential for market trends such as low demand and negative prices resulting in decreasing MCL level in the near future. These market changes may present additional prudentials risks, the implications of which AEMO will have to consider.

Meeting the prudential standard

- The prudential standard was met in two regions, Queensland and South Australia, and was close to being met in New South Wales and Victoria, with the POE at 2.3% and 2.6% respectively.
- The prudential standard was not met in Tasmania, with POE at 4.4%. The high POE for Tasmania doesn't represent additional prudential risk, rather is an artefact of the modelling due to a smaller data set being available for the region and the 2016 Basslink outage.
- While the prudential standard was exceeded in New South Wales, Victoria and Tasmania regions, there was no payment shortfall in the market, as the POE is based on a theoretical calculation and does not consider additional credit support provided by market participants.
- With MCL levels better aligned with actual market conditions than in previous years, the POE has returned to more historic levels to be in line with the prudential standard.
- Observing the downward trend in POE for all regions, AEMO expects that going forward, the POE for all regions, except Tasmania, will be in line with the 2% prudential standard.

2.4 Intended actions

As the prudential standard is currently met or close to being met in most regions and MCL levels are believed to reflect actual market conditions, AEMO does not foresee the need for further changes to the Procedures as an outcome of this Review. The VF percentiles were last recalibrated in 2020 summer review (effective in December 2019). The next scheduled recalibration of AEMOs regional model will be in 2022/2023.

In 2022, AEMO will review its prudential process to determine if there are any additional prudential risks emerging due to market trends such as low demand and negative prices. Any changes to relevant procedures and/or the Regional Model that AEMO thinks may be required as an outcome of this review will be presented to market participants, and undergo consultation as required under the Rules.

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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 2021 winter, 2021 shoulder and the 2022 summer seasons.

Table 4 Outstandings Limit Volatility Factor (VFOSLR)

Region	2021 Winter	2021 Shoulder	2022 Summer
NSW	1.4	1.36	1.61
QLD	1.35	1.41	1.5
SA	1.51	1.41	1.84
TAS	1.55	1.38	1.52
VIC	1.51	1.37	1.72

Table 5 Prudential Margin Volatility Factor (VFPMR)

Region	2021 Winter	2021 Shoulder	2022 Summer
NSW	1.98	2.04	3.45
QLD	1.81	1.88	2.71
SA	2.19	1.89	4.95
TAS	1.86	1.7	1.72
VIC	2.01	1.74	4.16

Table 6 Average Price (PR)

Region	2021 Winter	2021 Shoulder	2022 Summer
NSW	\$58.76	\$62.17	\$59.73
QLD	\$52.16	\$51.86	\$64.19
SA	\$67.88	\$54.17	\$69.74
TAS	\$58.35	\$56.29	\$60.36
VIC	\$59.70	\$53.33	\$55.14

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	99.8%
QLD	100%
SA	99.0%
TAS	100%
VIC	100%

Glossary

This document uses many terms that have meanings defined in the National Electricity Rules (NER). The NER meanings are adopted unless otherwise specified.

Term	Definition
CLP	<i>credit limit procedures</i>
MCL	<i>maximum credit limit</i>
NER	National Electricity Rules
OSL	<i>outstandings limit</i>
PM	<i>prudential margin</i>
POE	<i>prudential probability of exceedance</i>
VF	<i>volatility factor</i>
WDR	<i>wholesale demand response</i>