AEMO
AUSTRALIAN ENERGY MARKET OPERATOR

REPORT: EFFECTIVENESS OF THE NEM PRUDENTIAL SETTINGS METHODOLOGY

30 October 2020

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.

DISCLAIMER

This document or the information in it may be subsequently updated or amended. This document does not constitute legal or business advice, and should not be relied on as a substitute for obtaining detailed advice about the Wholesale Electricity Market Rules or any other applicable laws, procedures or policies. AEMO has made every effort to ensure the quality of the information in this document but cannot guarantee its accuracy or completeness.

Accordingly, to the maximum extent permitted by law, AEMO and its officers, employees and consultants involved in the preparation of this document:

- make no representation or warranty, express or implied, as to the currency, accuracy, reliability or completeness of the information in this document; and
- are not liable (whether by reason of negligence or otherwise) for any statements or representations in this document, or any omissions from it, or for any use or reliance on the information in it.

VERSION CONTROL

Version	Release date	Changes
1	30/10/2020	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 2020 review analysed prudentials data from 1 April 2019 to 31 August 2020, assessing whether:

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

The 2020 review found that MCLs were set appropriately for the analysis period, with MCL levels in line with prevailing market conditions. Correspondingly, the 2% prudential standard was met in the New South Wales, Queensland and South Australian regions. The prudential standard was exceeded slightly in the Victorian region at 2.6% and was above the prudential standard in Tasmania at 4.7%.

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 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 CLP, implemented over the past three years, have resulted in MCL requirements being significantly better aligned with actual market conditions than they were previously. As an evidence of the appropriateness of these changes, all regions expressed a downward trend in prudential exceedance over the past year. AEMO expects that going forward, the prudential exceedance for all regions bar Tasmania will return to historic levels and be in line with the 2% prudential standard.

As the prudential standard is currently 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 regional model or the Procedures as an outcome of this Review.

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

Contents

Tables

Figures

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 CLP[2] 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:

$$Maximum\ Credit\ Limit\ =\ Outstandings\ Limit\ +\ Prudential\ Margin$$

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 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 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

[1] See https://www.aemo.com.au/-/media/Files/Electricity/NEM/Settlements_and_Payments/Prudentials/2019/Credit-Limit-Procedures-v5-FINAL.pdf

[2] See https://www.aemo.com.au/-/media/Files/Electricity/NEM/Settlements_and_Payments/Prudentials/2019/Credit-Limit-Procedures-v5-FINAL.pdf

[3] CLP v.4.0 (effective until 2 December 2019) defines the MCL seasons as - summer (December to March), winter (May to August) and shoulder, split into two parts (shoulder 1 - April and shoulder 2 - October to November). The recently amended CLP v.5.0, moves the month of April from the shoulder season to the winter season (effective from 3 December 2019). For consultation documents, please see: https://www.aemo.com.au/Stakeholder-Consultation/Consultations/Five-Minute-Settlement---Credit-Limit-Procedures

the remaining market participants who are net creditors in the market (considering both energy and reallocations).

1.3 Changes to the CLP in 2019/2020

In 2019, AEMO completed a consultation[4] to amend the CLP to support the implementation of the Five-Minute Settlement Rule, as well as to simplify the season definitions (removal of the shoulder 1 season). These updated procedures have been effective since 3 December 2019.

AEMO is currently undertaking a consultation[5] to amend the CLP to support the implementation of the Wholesale Demand Response Mechanism. This consultation is scheduled to be completed by the end of 2020 and be effective shortly after.

[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 April 2019 to 31 August 2020, including the 2019 shoulder 1, 2019 winter, 2019 shoulder 2, 2020 summer and 2020 winter seasons[6]. The review assessed whether:

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

2.1 Setting of MCL levels

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

2.1.1 Short term prudential trends

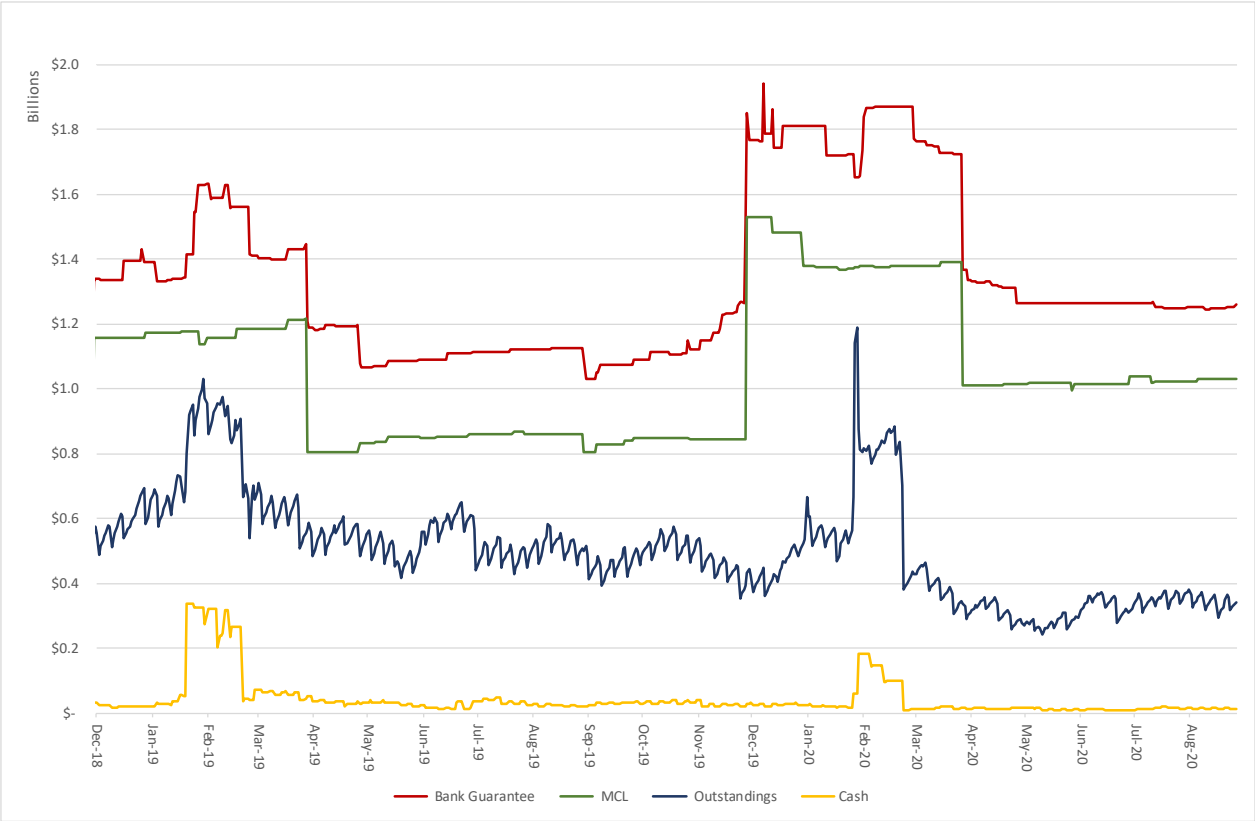
Figure 1 shows the total MCL[7] and total outstandings[8] as well as total guarantees and cash (security deposits) provided by market participants over a 21 month time period.

[6] 2020 was the first year that the shoulder 1 season was removed and combined with the winter season.

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

[8] Sum of outstandings for all market participants.

Figure 1 Key prudential indicators (1 December 2018 – 31 August 2020)



Key observations:

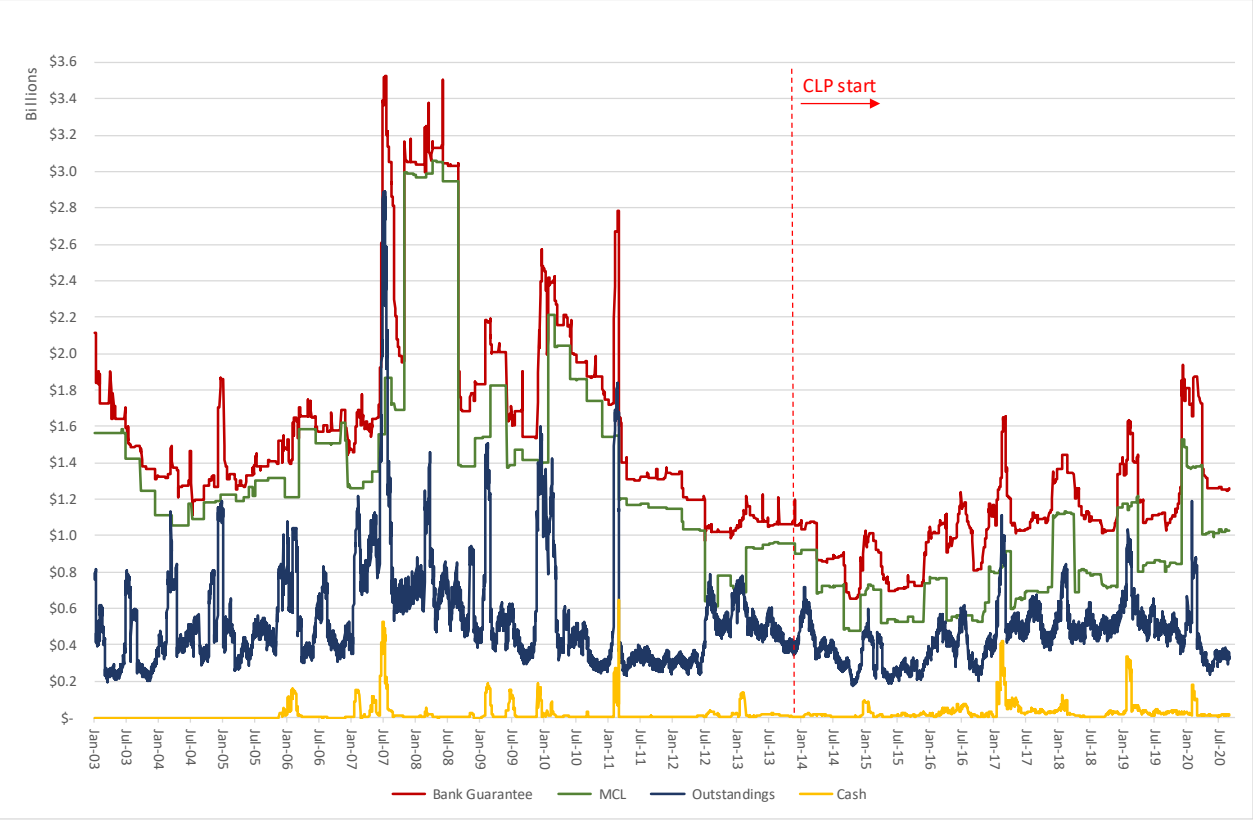
- There were no time periods where total outstandings were above total MCL levels. This indicates that broadly speaking, MCL levels were set appropriately for the time period for all three seasons. In previous years there were multiple time periods where outstandings were above MCL levels, usually indicting 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.
- Outstandings levels were flat for a significant portion of 2019, mostly between $400 and $600 million during from April to December.
- Outstanding levels have also been flat for a large portion of 2020, being at or below $400 million since March.
- The 2020 summer period had a higher peak of outstandings than 2019, due to an early February 2020 high price event. However, if excluding that short high price period, overall summer 2020 outstandings were lower ($0.8-$0.9 billion) than in summer 2019 ($0.9-$1.0 billion).
- MCL levels were higher for summer 2020 than for summer 2019. However, participants still provided a significant amount of additional guarantees above their MCL requirements. This indicates that participants anticipated the need for additional prudential support for the 2020 summer period.
- Likely due to the higher MCL levels and the amount of guarantees provided for summer 2020, there was a lower need for ad-hoc management for participant outstandings, as evidenced by the lower amount of security deposits supplied compared to the 2019 summer. This further indicates that MCL levels were set appropriately and likely has meant reduced costs for market participants as the provision of security deposits comes at a higher cost than guarantees.

- The highest total outstandings for both years was between mid-January to the end of February. This four to six week time period is when AEMO sees the most operational prudential activity, with participants reacting to high prices/demand with additional credit support (guarantees and security deposits).

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)



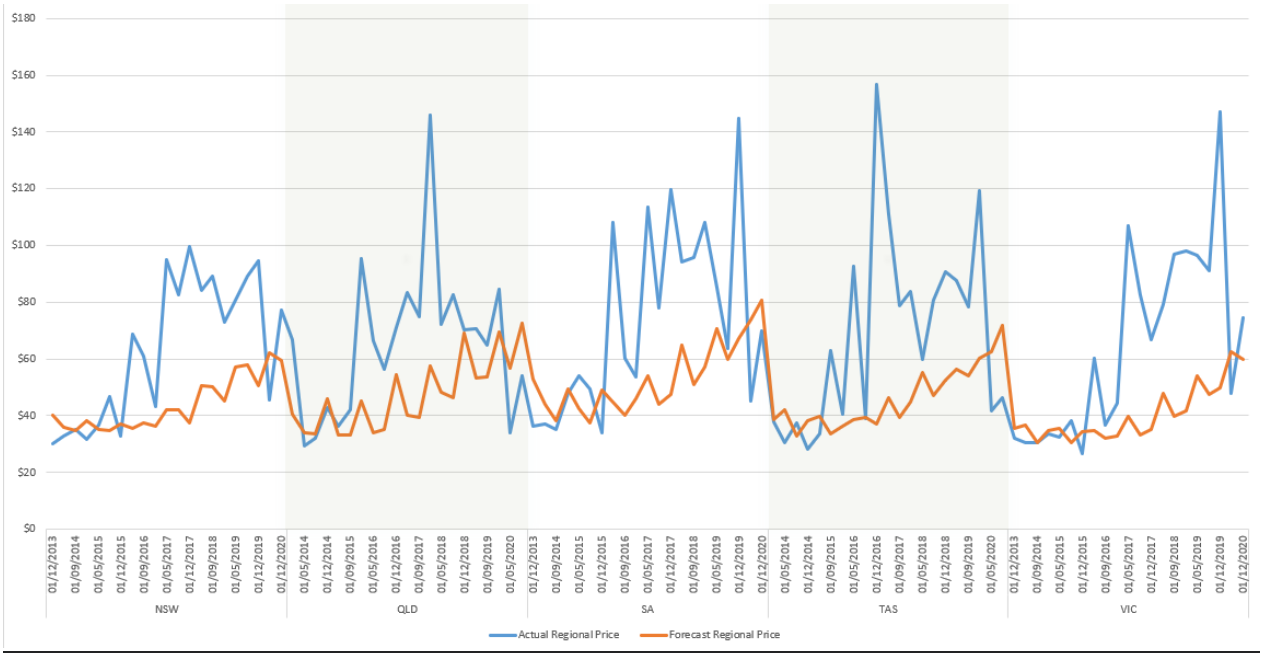
Key observations:

- 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.
- The total outstandings over 2019 was very similar to that of the a past few years, however, there has been a decline in outstandings since March/April 2020. This is the result of a combination of factors, including the effects of Covid-19 on the electricity market affecting both demand and prices. It remains to be seen whether this trend continues into the future. If there is a long-term trend of price and/or volatility reduction, AEMO's regional model will incorporate these into future price and volatility forecasts and hence MCL calculations.
- 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.
- Market participants readily use security deposits during periods of high outstandings (usually due to transient high prices, such as those in January/February 2017, 2019 and 2020).

- Mid 2014 to the start of 2015 represents a low point in outstandings, MCL levels and guarantee levels. Outstanding levels from March 2020 onwards are similarly low.
- Outstandings had a step increase from late 2016 onwards, due to price and volatility increases in all regions. 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.

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



Key observations:

- In all regions, actual prices were at a low point in 2014 and early 2015, spiking up from mid-2015 and continued to climb until 2019.
- Forecast prices slowly increased from 2014, following actual market price increases, but lagging significantly behind actual prices in all regions from 2015 to 2019.
- After the series of changes were made to the CLP and AEMO's regional model over the past few years, forecast prices in all regions are now aligned with the actual prices.

2.2 Meeting the prudential standard

2.2.1 Regional model recalibration

The 2018 CLP Effectiveness Review[9] found that the 2% prudential standard was not met for all regions. This was due to a combination of factors, including design limitation of AEMO's regional model and sustained high prices and volatility over the 2016-2018 time period. In order to meet the 2% prudential standard going forward, several changes were made to AEMO's regional model in 2019.

[9] See: https://www.aemo.com.au/-/media/Files/Electricity/NEM/Settlements_and_Payments/Prudentials/2018/CLP-Effectiveness-Review-2018_FINAL.pdf

The regional model was adjusted to better reflect real life prudential processes, now allowing for no prudential assessment on weekends and most public holidays as small adjustments to load and price data at model commencement. The regional model was also recalibrated 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 AEMOs 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 3.

As shown below, at the end of the current analysis period (31 August 2020), the prudential standard is met in the NSW, QLD and SA regions. The prudential standard is still exceeded in the TAS and VIC regions, being 4.7%[10] and 2.6% respectively. Despite this exceedance, the POE has been on a downward trend for all regions since 2017/2018 indicating that the measures taken by AEMO to recalibrate and adjust the regional model over the past few years have been working as intended.

Additionally, it is important to note that despite the prudential; standard not being met in all 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 prudential requirements, are not considered as part of the prudential POE calculations.

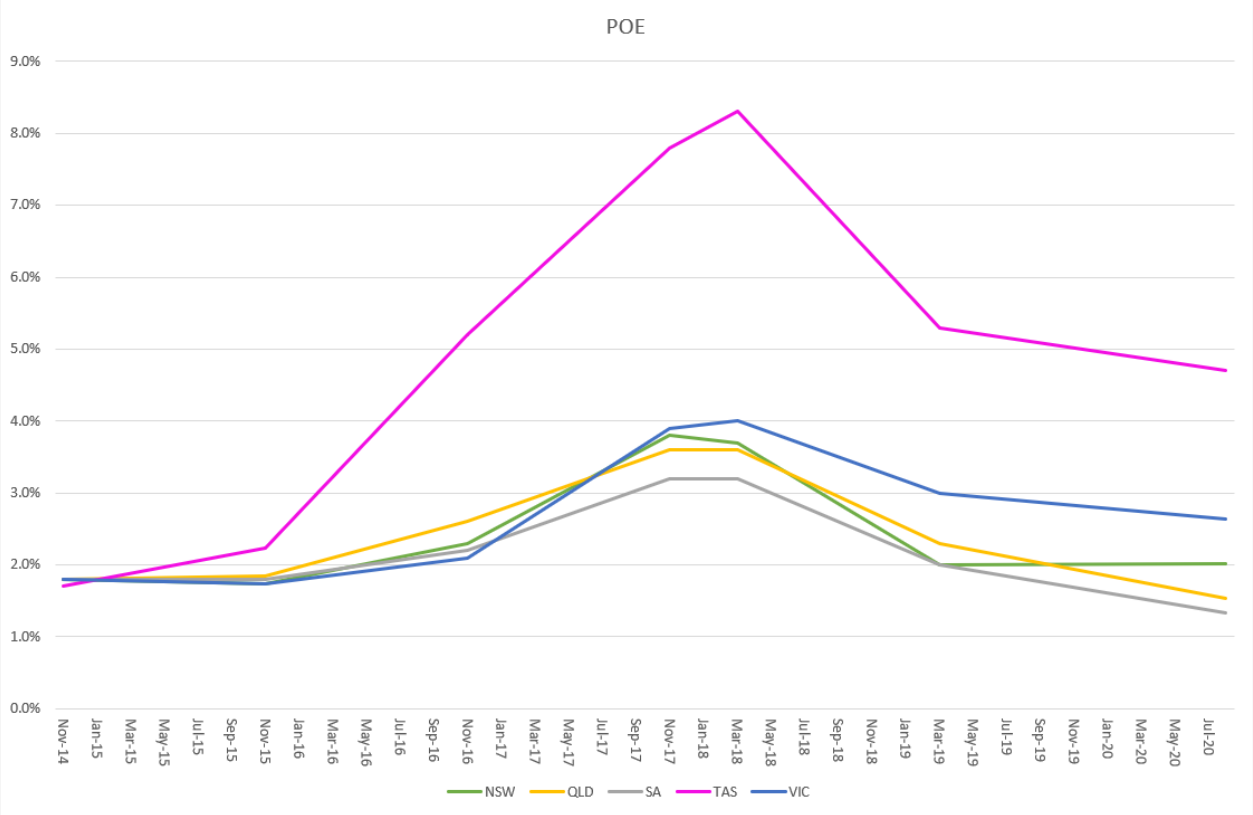
Table 2 POE for the past 5 years

	Prudential data to 30 November 2016	Prudential data to 30 November 2017	Prudential data to 31 March 2018	Prudential data to 31 March 2019	Prudential data to 31 August 2020
NSW	2.3%	3.8%	3.7%	2.0%	2.0%
QLD	2.6%	3.6%	3.6%	2.3%	1.5%
SA	2.2%	3.2%	3.2%	2.0%	1.3%

[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.

	Prudential data to 30 November 2016	Prudential data to 30 November 2017	Prudential data to 31 March 2018	Prudential data to 31 March 2019	Prudential data to 31 August 2020
TAS	5.2%	7.8%	8.3%	5.3%	4.7%
VIC	2.1%	3.9%	4.0%	3.0%	2.6%

Figure 4 Changes in POE since the start of the CLP



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 New South Wales, Queensland and South Australian regions. The prudential standard was exceeded slightly in the Victorian region at 2.6% and was above the prudential standard in Tasmania at 4.7%.
- For all regions, the POE currently is much better aligned with the prudential standard than has been the case over the past few years. 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 recent changes to AEMOs regional model (as described above).
- Changes to the CLP over the past few years, together with the recent recalibration and modelling adjustments, have resulted in prudential requirements being significantly better aligned with actual market conditions than they were over the 2016 to 2018 time period.
- AEMO expects that going forward, prudential exceedances for all regions bar 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 appropriately for the analysis period, with MCL levels in line with prevailing market conditions.
- Changes to the CLP, implemented over the past two 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.

Meeting the prudential standard

- The prudential standard was met in three regions, New South Wales, Queensland and South Australia, and was close to being met in Victoria, with the POE at 2.6%.
- The prudential standard was not met in Tasmania, with POE at 4.7%[11].
- While the prudential standard was exceeded in 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.
- AEMO expects that going forward, the POE for most regions bar Tasmania, will be in line with the 2% prudential standard.

2.4 Intended actions

As the prudential standard is currently 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 regional model or the Procedures as an outcome of this Review.

If there is a significant long-term downward trend in prices or volatility this will be reflected in the regional model over time.

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

[11] 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.

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 2019 winter, shoulder 2 and the 2020 summer seasons.

Table 4 Outstandings Limit Volatility Factor (VFOSLR)

Region	2019 Winter	2019 Shoulder 2	2020 Summer
NSW	1.25	1.35	1.48
QLD	1.24	1.35	1.62
SA	1.42	1.42	1.84
TAS	1.42	1.46	1.46
VIC	1.25	1.25	1.67

Table 5 Prudential Margin Volatility Factor (VFPMR)

Region	2019 Winter	2019 Shoulder 2	2020 Summer
NSW	1.54	1.77	2.75
QLD	1.69	2.07	3.1
SA	2.25	1.88	4.92
TAS	1.89	1.93	1.7
VIC	1.51	1.46	4.01

Table 6 Average Price (PR)

Region	2019 Winter	2019 Shoulder 2	2020 Summer
NSW	$58.03	$56.93	$59.57
QLD	$53.25	$52.49	$71.79
SA	$71.61	$60.27	$79.52
TAS	$51.83	$60.69	$71.38
VIC	$54.85	$48.01	$59.94

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	*credit limit procedures*
MCL	*maximum credit limit*
NER	National Electricity Rules
OSL	*outstandings limit*
PM	*prudential margin*
POE	*prudential probability of exceedance*
VF	volatility factor