6 November 2009

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Dr John Tamblyn
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Australian Energy Market Commission
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Dear John

Re | Draft PwC report – Review into the role of hedging contracts in the existing NEM prudential framework - AEMC Reference EMO0008

Thank you for the opportunity to provide this submission to the above Review.

AEMO would like to offer the following observations on the PricewaterhouseCoopers (PwC) draft report "Review into the role of hedging contracts in the existing NEM prudential framework".

AEMO supports the development of further alternatives for the management of credit risks in the NEM and notes that Futures Offset Arrangements (FOA) and the use of published futures contract prices have potential to provide improvements to the NEM prudential regime. However some of the arrangements analysed in the PwC report will change risk profiles in the complex NEM prudential framework. To ensure the prudential scheme remains robust overall, it is essential that the prudential standard of the NEM is well understood and kept intact. The prudential standard is stated in the Rules, and currently requires that collateral be held by AEMO to the level that would only be exceeded once in 48 months.

There is clearly some difficulty in interpreting and implementing that standard as indicated by the PwC report and in particular our comments on their findings. Therefore it is important that this standard be clarified (or redefined) as a matter of policy.

The FOA model presented utilises an arrangement where credit support is forgone on the basis of another instrument which appears to have a large termination risk. This is a style of change that has not been contemplated in the NEM prudential framework before. Reallocations have previously been introduced, but reassign the affected risk between NEM participants.

Given the different approach taken in the FOA model, AEMO is of the view that the prudential standard clarification needs to be completed so that changes to the current regime, such as design and introduction of FOAs can be assessed to ensure the mechanism does not compromise the standard.

Transparent and robust modelling should be carried out on any new arrangements such as FOAs, to ensure that the standard can be met at least as efficiently as current arrangements by the new mechanisms.

While we appreciate that a significant amount of modelling and analysis has been done by PwC, we found that it falls short in terms of both transparency and demonstrating that the performance standard for prudentials is met. The remainder of our submission aims to demonstrate this. In fact we believe some of the recommendations have potential to erode the current standard, no matter how it is interpreted.

The work on Maximum Credit Limits (MCL) will require a rethink on approach, as the modelling does not consider the operational imperatives, some of which were discussed in the working group. Furthermore, we believe that in order to incorporate one of the key findings regarding load variances, a new algorithm and/or a new approach to calculating MCLs will be required. This could be progressed by either AEMO or AEMC, but in our view, development in that area is likely to limit the opportunity for the use of just base load futures prices in MCL calculations.

In preparing this submission AEMO has carried out some modelling and made a number of assumptions. Given the short time to respond and the complexity of the material it is possible that we have misinterpreted some components of the report prepared by PwC.

AEMO is pleased to continue to support the review through its participation in the AEMC working group and direct interaction as necessary. We look forward to the Commission's consideration of our submission. If there are any queries about this submission, please do not hesitate to contact Craig Parr, Senior Manager Metering and Settlements on 02 8884 5030.

Yours sincerely

Brian Spalding.

Brian Spalding
Executive General Manager Operations

cc:

Attachments: A - Principle Report observations and executive summary

B - Report Clarifications

C - Editorial comments on the PwC Report

Appendix A: Principle report observations

1 Executive Summary

1.1 Prudential Framework Context

The NEM rules have explicit obligations on market participants to pay NEM financial transactions (Rule 3.15.17), however the Rules also provide for a prudential framework to support certainty of payment under the market participant failure (retailer / generator) ie they no longer meet their obligations under reasonable worst case conditions.

Any analysis of financial risk associated with NEM financial transactions needs to consider its operation under the failure of a market participant (ie they do not meet their obligations under the Rules or a contract), rather than just relying on compliance with rules or contractual components.

1.2 Futures Offset Arrangements (FOA).

AEMO is of the view that the termination risk of FOA is still a key risk that requires more analysis. In particular the contract relationship proposed for the models offers little value to the NEM in terms of forward risk. The model proposes Rule obligations, audit arrangements and a two part contract (clearing participant to Retailer, Retailer to AEMO). None of these arrangements provides any certainty for forward risk coverage. The report appears to suggest that these contractual arrangements provide additional protection when in fact they should be ignored for the analysis because the purpose of the prudential regime is to provide security for payment from the point of retailer failure and FOA termination, including when agreements are not met. To take this to the logical conclusion we have compared this with an optional MCL model, where the participant is only required to lodge credit support to cover the prudential margin, and there does not appear to be any difference in risk between these two models. Therefore, from the time an FOA is terminated the exposure of the market under the FOA model is identical to an optional MCL. An optional MCL model does not have the same inherent level of coverage as the current regime.

1.3 Time taken to remove participant liability in the event of a failure

Various sections of the PwC report refer to the time taken or additional risk posed by the various reallocation or FOA arrangement failures within the NEM. AEMO has performed a review of this area and believes that the analysis is not consistent with the timeframes in the NEM Rules. We have also conducted this analysis, using the approach from PwC on an Optional MCL[1] model.

In summary the risk to the NEM in an unwind scenario, under the assumption the participant is on their trading limit and they then fail, is as follows for the various scenarios;

[1] Optional MCL is where the retailer only provides credit support to cover their prudential margin

	LIABILITIES (OVER TRADING LIMIT)	OFFSETS
Unreallocated retailer	4 days physical load	None
Reallocated retailer	4 days physical load	4 days reallocation credit
Two party failure[2] (generator)	3 days reallocation debit	Any generation credit
Two party failure (retailer)	4 days physical load	1 days reallocation credit
Retailer FOA termination	4 days physical load	None
Unreallocated retailer with reduced MCL	4 days physical load	None
Unreallocated retailer with optional MCL	4 days physical load	None

1.4 Prudential margin versus MCL component

In a number of places the PwC analysis has focused on the risk scenarios where a participant is right on their trading limit and then considered the impact from this point forward. Taking this to the logical conclusion this implies that the current levels of MCL in excess of the prudential margin provides no value, and hence an Optional MCL regime, which has essentially no excess credit support over the prudential margin, provides the same risk coverage as the current NEM prudential regime.

If the PwC analysis is supported so that only the prudential margin offers any value, then it logically follows that it would be appropriate to introduce an optional MCL regime, as it would reduce the capital tied up in the NEM and simplify the current prudential framework. We also note that other markets such as the Victorian declared wholesale gas market operate this way. In AEMO's view this approach appears to undervalue the current MCL held by AEMO. In particular the current MCL provides some initial coverage at the onset of a high pricing event.

AEMO suggests:

- A specific focus on addressing termination risk – AEMO continues to consider that this might need involve a discount to the allowable MCL relief where termination risk is not addressed, as not doing so would swap secure collateral (the guarantee) for an unsecured cash flow
- PwC claim that 1 extra day in the prudential margin (PM) relies on it being adequate. This assertion should be tested. AEMO is not convinced that the PM is robust enough to be relied on this way.

[2] A two party failure is where a reallocated generator suffers physical plant failure leading to financial default and cancellation of the reallocation by AEMO. The counterparty retailer then receives additional liability.

1.5 Two Party Default

The report discusses the impact of a two party failure when reallocations are used. If a two party failure is to be considered then flow on impacts of Retailer failure should also be considered. AEMO is of the view that the two party failure event identified by PwC is a rare and unlikely event and is not a reasonable worst case event

1.6 FOA formula and the PwC model

The AEMC working group formulated two models of the FOA for risk analysis, unfortunately the PwC report did not carry out the analysis on these models, rather they chose a new option (the *PwC model*) and then carried out their analysis on this. This new *PwC model* adds complexity to the discussion as not all the details associated with the operation of this model are detailed. Key areas of concern for the *PwC model* relate to

- Unfunded uplift component – the *PwC model* incorporates an additional uplift factor (AS component[3]) to provide moneys from the *PwC model* into the NEM. The aim appears to be to ensure the formula provides cash flow when the futures price does not rise in concert with the spot price. The additional payment stream is not funded by the clearing participants margin payments and hence is unfunded and unsecured from a FOA risk perspective.
- Uplift duplicating NEM prudentials – given that the uplift component is not always funded, this part of the equation is just duplicating what the NEM prudential process already does on a dollar basis.
- Risk analysis – the risk analysis has been performed on the total cash flow from the model including the unfunded component. This is inappropriate as this cash flow is artificial and not part of the margin payments. The risk analysis needs to be performed purely on the cash flows available from the clearing participant. The risk that needs to be assessed is to identify when the futures margin payments do not match the corresponding increase in NEM outstandings.
- OP/DQ ratio – The formula in the PwC model has an additional component that scales the margin payments based on the ratio of OP/DQ, This ratio is usually 39% or 23% for Reduced MCL. There are two issues here
  - This appears to mis-understand how the margin payments are generated, whereby the underlying principle was that the full margin payment would usually correlate to the change in NEM outstandings spot price on that day and hence should not be scaled. This consequence is hidden by the uplift calculation above.

[3] See page 41 of PwC report

– Whilst the uplift component partially hides the consequences for normal MCL calculations, when a reduced MCL is used, then the formula no longer matches the required NEM cash flows. Access to PwC's detailed modelling may clarify this point.

1.7 FOA Modelling and analysis

A key issue around the FOA is how it will operate within the NEM on a day to day basis. The report does not provide modelling around the day to day cash flows required for the NEM and futures margin payments (noting the comments above on some issues with the formula). In particular, normal NEM operation events need to operate on a rolling settlement cycle basis and consider settlement payments, daily outstandings and what happens over the beginning and end of a Futures quarter.

It is AEMO's opinion that analysis of the FOA proposition requires assessment of the following aspects/risks:

- The daily operational performance of each model with respect to the cash flows generated from the available Futures Margin Payments and how this relates to the reduction in MCL which the model has afforded.
- Assessment of any systemic risk that each model may present.
- A comparative analysis of the performance and risks presented by each model (model 1, model 2, PwC model and no FOA)
- Scenario analysis with respect to each of the models and how this impacts on their relative performance. For example, variance in Futures Lodgement Price, percentage of load offset etc.
- Correlation of the Futures Prices to the average spot price (AS) within the rolling settlement outstanding period, and not within the quarter as a whole.

In particular, taking the PwC model as an example, an operational model would have raised the following issues:

- The frequency of Variation Margin Payments which are not supported by actual Futures Margin Payments.
- The exaggerated weighting of movements in spot price early in a quarter due to the low number of days over which averaging occurs to derive an 'AS' value. This leads to an increased requirement for Variation Margin Payments that are not supported by Futures Margin Payments.
- The impact of a week of outstandings falling from the AS calculation on a settlement day. This can lead to the need for Variation Margin Payments which are not supported by Futures Margin Payments.
- The impact of resets with regard to the frequency of days on which the participant is sitting on their trading limit. (This point might be considered pertinent in any termination risk discussion).
- How the beginning and end of the quarter should be dealt with operationally and if a mechanism is needed to transition between quarters.

The preliminary work carried out by AEMO in the analysis of the various FOA models has shown that FOA can in some circumstances be an effective prudentials management tool. However, the PwC model disassociates the underlying Futures instrument from the FOA payment stream and as such is not considered favourably.

In summary, it would have been clearer if the risk analysis had not been carried out on the models developed by the AEMCs working group. The new model developed has not been fully explained and the risk analysis is not clear.

It is recommend that a model be determined and then carry out detailed risk and operations analysis on that model.

1.8 Security Deposit (SDA) Clawback

The FOA model results in credit support (bank guarantee) being reduced in return for cash being held by AEMO (in the form of a SDA) and hence a key risk consideration for a FOA model is whether the clawback under insolvency or administration is an issue. The PwC discussion on clawback is inconclusive and is inadequate to support any recommendation on the matter. We recommend that more robust advice on clawback be obtained.

1.9 Load shape analysis on hedging instruments

Two sections of the report (3.2.6 and 4.3.3) consider issues associated with varying load shapes and hedging instruments. PwC have proposed that rather than assess the risk of load shape variances with a beta factor that AEMO should carry out modified MCL analysis. AEMO agrees that changes could be made to the MCL process to consider these issues. AEMO's initial work has considered utilising some form of MCL analysis that breaks up each day into (say) peak, shoulder, and off-peak times, and that the MCL should be analysed on a component basis. Similarly this would necessitate consideration of development of volatility factors and average prices for each of these periods. This form of model would address concerns in relation to reallocations and the PwC identified load balancing risks.

1.10 Maximum Credit Limit (MCL)

1.10.1 Reasonable Worst Case

A pivotal area within the Rules and hence the NEM prudential framework is the definition "*reasonable worst case*", and the PwC report carries out analysis of this concept.

Whilst the PwC report identifies out a logical/ statistical approach which is very helpful in the work around clarifying *reasonable worst case*, in AEMO's view the reported methodology results shows that this methodology is not a way of interpreting *reasonable worst case*. For example the 98% effectively means that any price in the NEM over $300 is not in scope of the NEM prudential regime. From AEMO's perspective this does not appear to be correct given the events of recent years. The impact of a NEM price of $10,000 can be substantial and this statistical approach excludes these events.

AEMO is concerned that PwC approach appears to dis-associate the price from the price-time sequence in which it occurred, which in our view is inappropriate and we suggest that it needs to work with the full sequence and work in blocks relevant to the issue we are trying to assess. For example, a process where we would examine prices in four week blocks rolling weekly. We could then take as the test that in 4 years we would only exceed limits once. The policy intension needs to be clarified in the Rules if necessary, and it is believed that this can only be done if the underlying assessment is mathematically and statistically robust.

In summary, given how difficult it is to distil a workable interpretation of the *Reasonable Worst Case* in the context of NEM prudentials, it now appears increasingly important that this aspect of the AEMC's review be pursued through to a conclusion to ensure that a workable interpretation is clarified, even if clarification of the wording in the Rules is required in order to reach a final position. Otherwise, there is a risk that the Rules may lack sufficient clarity and transparency to be workable.

Next steps:

We suggest that AEMC progress the analysis of what *reasonable worst case* the prudential regime should cover by:

- Taking input from the working group, establishing a list of market events and deciding whether they should be covered by the prudential regime or not – eg 4 Cumulative Price Threshold (CPT) events, 3 CPT events … 1 CPT event, high prices such as June 2007 in NSW
- Construct a probabilistic model for reasonable worst case that is based on a moving window of price outcomes over a specified past period. Mathematical or statistical advice is likely to be required to construct this model.
- Test the model against the initial list of events that should be covered
- Clarify with the market and with AEMO that this approach, or another method is what the AEMC is expecting to be used to satisfy the reasonable worst case under the National Electricity Rules.
- Assess the impact of these changes to the NEM participants
- If a clear interpretation of *Reasonable Worst Case* cannot be reached under the current Rules, AEMC should clarify the Rules to ensure clarity and workability.

1.11 Analysis of various MCL components

1.11.1 Baseline assumptions - time taken to run an MCL review

The time taken to execute a full MCL review is of the order of 4-5 weeks prior to the start of an MCL quarter and it is not feasible to carry out the review only 5 days prior to the start of the quarter. It is unfortunate that the analysis has been carried out utilising futures prices only 5 days prior to the start of the quarter, as it does not appear that this can be implemented. The MCL quarter does not align with financial quarters for the future contracts and AEMO

recommends against changing this aspect of the MCL reviews as they need to align with the seasons.

1.11.2 Prudential Margin Adequacy and linearity

The PwC report operates on the assumption that the prudential margin provides 7 days coverage. Under the current AEMO approach the prudential margin (PM) is calculated using historical price outcomes. A number of scenarios can be easily identified where the prudential margin would be inadequate to cover the period taken to suspend a participant (as set out in the table above). However it is more difficult to determine if these scenarios are reasonable worst case (see discussion above). The report highlights that some risk scenarios would add one extra days risk and PwC concludes that this could be resolved by adding one extra day of PM. One extra days exposure does not relate to one additional days PM.

This will be less critical to the report as shown in the analysis "Time taken to remove participant liability in the event of a failure" above on FOA and 2 party failure.

1.11.3 Prudential Margin used in new models

The various MCL models that have been presented need consideration as to the impact of the chosen PM for that model. For example, the stress test MCL approach applies a stress test prudential margin (much larger), with very different results on how MCL capital is utilised by participants, whereby under the *stress test prudential margin* model most of the capital in this MCL model would be tied up (or preserved) requiring much larger daily margin payments to cover the position. This needs to be considered when assessing the effectiveness and efficiency of a regime.

1.11.4 Futures price volatility

The PwC report has chosen to utilise a different approach to volatility for a futures price based MCL than originally developed by the working group. The aim of a VF is to inflate the average by enough to cover a reasonable worst case of spot price excursions, Our view is that a more direct approach would be to measure the volatility of spot prices rather than using the futures volatility as a proxy for it - ie remain with the approach we already use, particularly as they are both backward looking over the same 12 month period. PwC have not provided enough reasoning as to why the futures VF is better than a spot price based VF.

1.11.5 MCL volatility

We note that some of the new models produce much larger variations in credit support and previous work in this area has identified that changing the MCL levels substantially can cause difficulties for participants. We therefore recommend that this be investigated and considered further.

1.11.6 Summary of MCL methodology

Given the issues associated with:

- the ability of AEMO to implement any of the models due to the above limitations around implementing an MCL 5 days prior to a quarter,
- seasonal quarters vs financial quarters
- the new issues identified with load shapes (as mentioned above) and the need for this to be addressed
- lack of clarity concerning the prudential margin in the models and analysis around efficiency and effectiveness
- the issues identified with the interpretation of *reasonable worst case*, and as this defines the target, and hence a clear lack of an assessable goal to measure compliance and success of the model.
- the decision to implement FOA or not is largely independent from changing the MCL.

It is noted that PwC comments that more work is required, particularly from a cost benefit analysis perspective. AEMO does not believe sufficient work has been done overall to vary the MCL approach to use futures contracts at this stage. In particular the load shape requirements will apply a very different methodology for MCL (breakup of prices intraday) which do not readily fit with the models presented. Work on this new approach can either be carried out by AEMC or could be carried out in the current context of the rules now by AEMO.

More detailed analysis and discussion of the issues raised together with additional items are developed in the following sections. Given the complexity and volume of work contained within the PwC report and the short time available in which to respond, it is possible that AEMO has misinterpreted some elements of the report.

2 FOA Termination Risk

Referenced in Sections: 4.3.1 of The PwC report

The assessment of termination risk in the report has focussed on the incremental risk created by the termination of the FOA instrument during several voluntary and involuntary scenarios. The key scenario from a prudential framework perspective is the failure of the participant, and related termination (and non-payment of Margin Payment) by the clearing participant. This scenario is critical because the prudential framework's primary function is to protect the NEM against shortfall during a participant failure.

Given the critical nature of the risk, and the actual and perceived risk that clearing participants can terminate an FOA during a participant failure, there is the need for further analysis and consultation required.

2.1 Forgone credit support

The reduction in MCL afforded by the lodgement of an FOA allows a participant to reduce the amount of credit support provided to AEMO. In return for this forgone credit support, the NEM would expect to receive a prudential instrument of equivalent effectiveness. credit support proves effective during a prudential failure as the instrument is with a third party, and is immune from any action by the failed party.

Although FOAs appear effective during normal conditions, during the failure of a participant there is no certainty of Margin Payment cash flow. The unsecured nature of this cash flow creates an incremental risk in the NEM.

2.2 Two party contract

The proposed two party contract arrangement does not appear to provide any additional certainty to the cash flow where the participant fails. At the point of failure, it must be assumed that the participant will not behave contractually, and because AEMO has no direct contract with the clearing participant that the Margin Payment would be dishonoured.

3 Participant Failure Risk Analysis

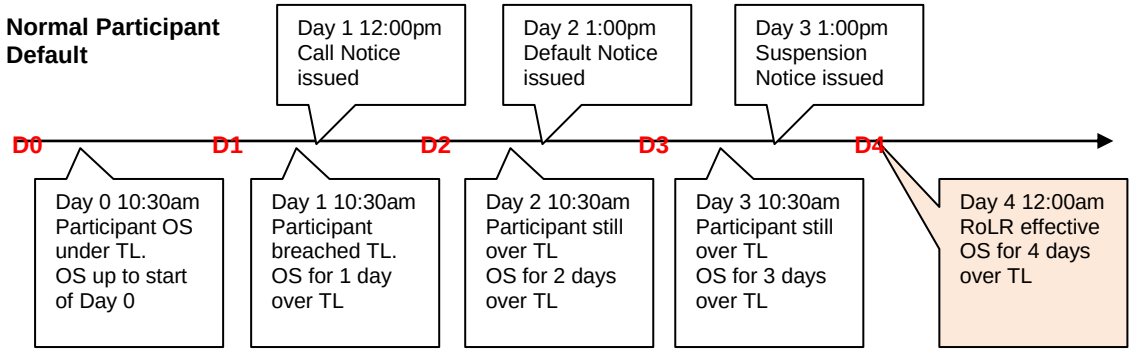
The report evaluates the relative merits of RAs and FOAs by assessing the amount of liabilities (outstandings) that can accrue between the point of failure and the time the participant is removed from the market. The following sections qualitatively model each scenario, based on a number of common assumptions:

- The participant(s) failing have an outstandings at the level of the trading limit prior to failure. This is a reasonable worst case position, and means that only the prudential margin remains as collateral to protect the NEM against shortfall.
- When issuing an MCL review, AEMO allows approximately 48 hours for credit support guarantees to be provided. Although under the NER the timeframe may be much shorter, 48 hours is proposed to be the minimum practical time that would avoid introducing additional risks of failure.

3.1 Unreallocated retailer failure

The diagram below represents the failure of unreallocated (no RA or FOA) retailer as a result of breaching their trading limit.

Figure 1: Timing of unreallocated retailer failure



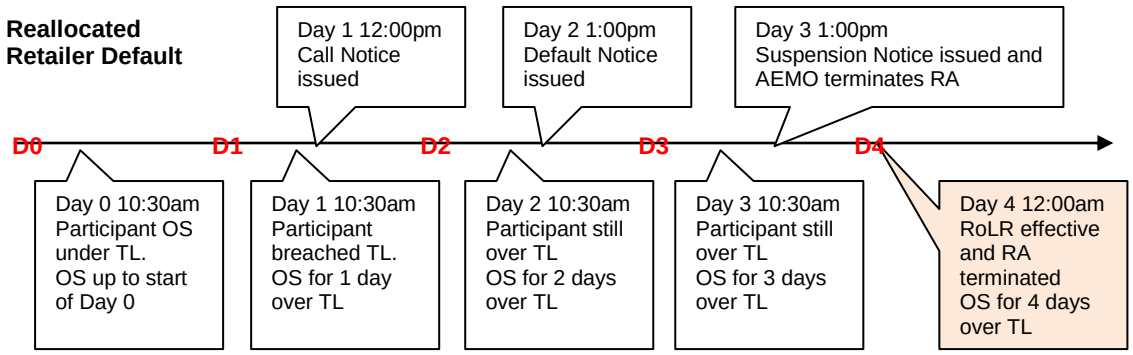
The result of this scenario is:

- A normal participant failure results in 4 days of outstandings in excess of the trading limit before (Retailer of Last Resort) RoLR is effective
- The 4 days outstandings are based on physical load exposure.

3.2 Reallocated retailer failure

The diagram below represents the failure of retailer with reallocation agreements as a result of breaching their trading limit.

Figure 2: Timing of reallocated retailer failure



The result of this scenario is:

- A reallocated retailer failure results in 4 days of outstandings in excess of the trading limit before RoLR is effective
- The 4 days outstandings are based on 4 days of physical load exposure, offset by 4 days of reallocations.

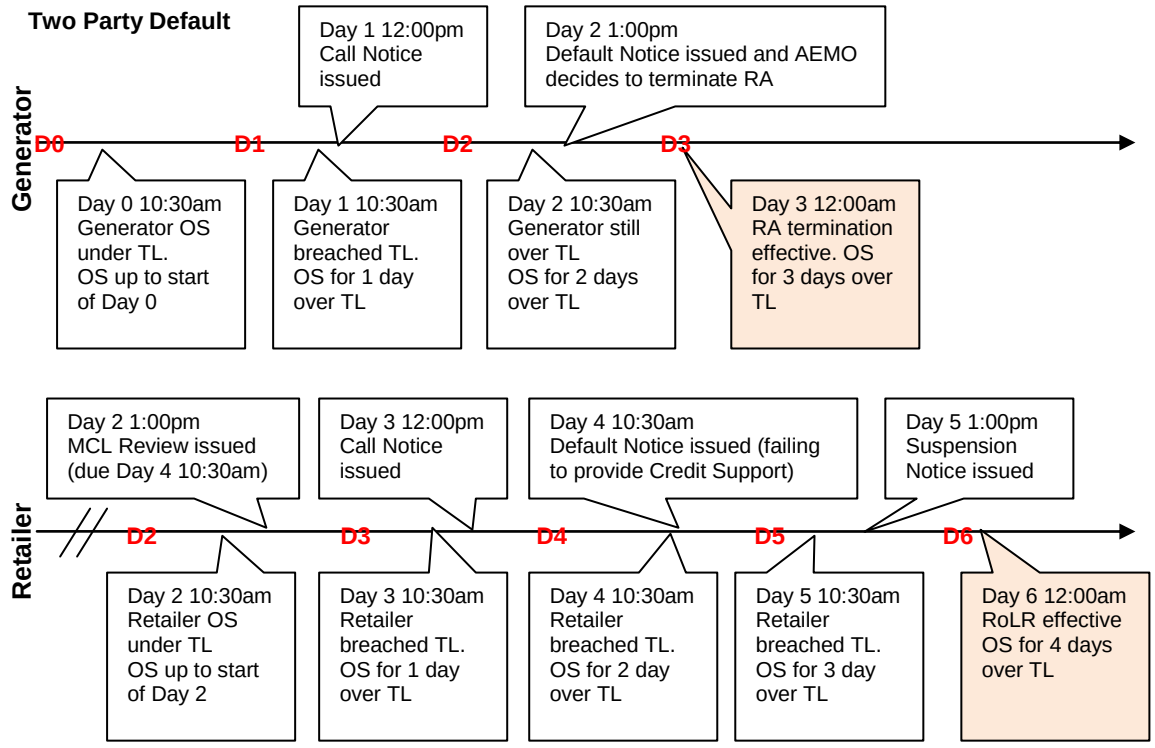
3.3 Reallocation Agreement two party failure

Referenced in Sections: 1.3.2, 3.2.1, 3.2.2, 3.2.3, 3.5, 3.5.1, 6.3.1

The incremental risk of a Two Party Default with an Ex Ante Reallocation is qualitatively described as “1 day of retailer consumption at market prices”. This is derived as being the time between 11am until 11am on the next NEM business day, based on these times being the payment deadline and the Notice time respectively. A number of assumptions have been made in the report which does not align with either the NER prudential obligations or AEMO’s processes for prudential supervision.

The diagram below is intended to show the timing of a Two Party Default.

Figure 3: Timing of Two Party Failure



The outcome of the timings above can be summarised as:

- The generator will accrue 3 days of outstandings in excess of the Trading Limit before the RA termination is effective. These outstandings are based on 3 days of reallocation debit (assuming the generator does not receive any credit for generation during the period)
- In a Two Party Default, the retailer will accrue 4 days of outstandings in excess of the Trading Limit before RoLR is effective. The 4 days of outstandings are based on 4 days of physical load, offset by 1 day of reallocations.

In addition to the common assumptions, several additional assumptions have been made:

- The retailer is over their trading limit on the day after an MCL review is issued.
- AEMO decides to terminate the RA. Because AEMO has discretion whether or not to terminate, a decision could be made based on the relative exposure to the NEM with and without the RA.

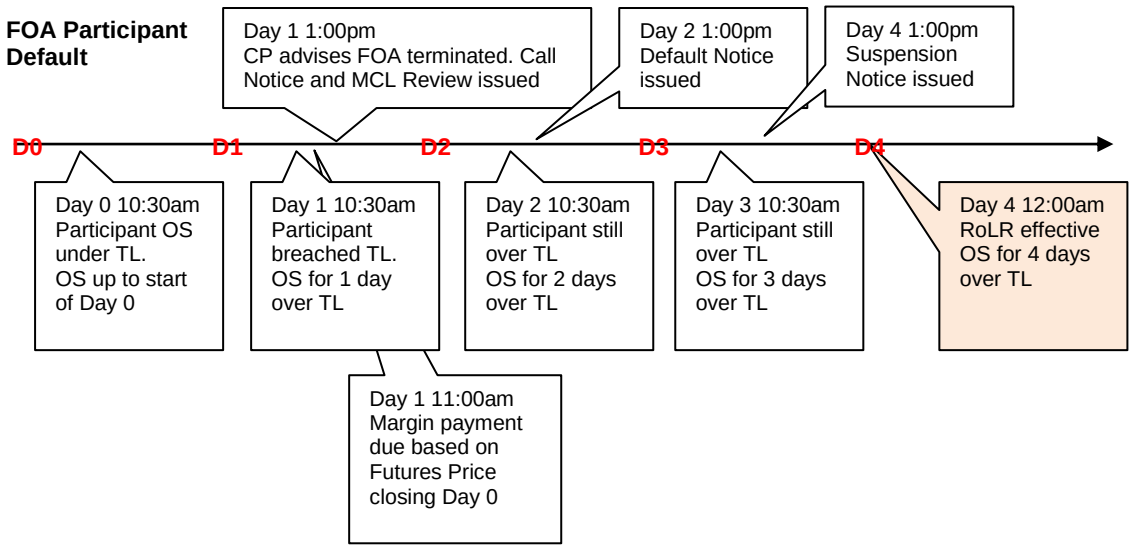
It is important to note that although the scenario assumes the generator is at their trading limit, it may not be reasonable worst case to also assume that the retailer is at their trading limit. Their default is triggered by failure to provide credit support, and any buffer below their trading limit would reduce the risk of the prudential margin being insufficient.

3.4 FOA termination

Referenced in Sections: 1.3.3, 4.3.1, 4.6, 6.3.2

The assessment of termination risk in the report identifies that there is an additional 1 day of risk which is incremental to existing default scenarios. The timing of this scenario is represented in the diagram below.

Figure 4: Timing of FOA termination risk



The outcome of the timings above can be summarised as:

- A retailer with FOA failure results in 4 days of outstandings in excess of trading limit
- The 4 days outstandings are based on physical load exposure, and there is no margin payments to offset this period.

3.5 Findings

The table below summarises the results of the various failure scenarios:

Table 1: Summary of participant failure scenarios

	LIABILITIES (OVER TRADING LIMIT)	OFFSETS
Unreallocated retailer	4 days physical load	None
Reallocated retailer	4 days physical load	4 days reallocation credit
Two party failure (generator)	3 days reallocation debit	Any generation credit
Two party failure (retailer)	4 days physical load	1 days reallocation credit
Retailer FOA termination	4 days physical load	None

In the case of RA and FOA, there is no incremental risk over the unreallocated retailer failure. Assuming the prudential margin is adequate to cover the failure of an unreallocated

retailer, it can be concluded that the prudential margin is also adequate to cover the failure under an RA or FOA.

3.6 Optional MCL

In addition to the scenarios above, it is useful to consider a situation of an unreallocated retailer with a reduced or optional MCL. An optional MCL would be model where the retailer is only required to provide credit support against the prudential margin (to cover the reaction period), and the remaining 35 days would be managed with either voluntary credit support or cash.

Table 2: Failure of participant with reduced/optional MCL

	LIABILITIES (OVER TRADING LIMIT)	OFFSETS
Unreallocated retailer with reduced MCL	4 days physical load	None
Unreallocated retailer with optional MCL	4 days physical load	None

In both of these scenarios, there is also no incremental risk when compared against an unreallocated retailer with normal MCL. This conclusion results from the following factors and assumptions:

- In the scenarios, the participants are assumed to have an outstandings on their trading limit. Any previous breaches are assumed to have already been covered either by cash or credit support
- Only the prudential margin is being considered, and there is no residual MCL at the point of failure

3.7 Additional MCL buffer

As discussed in the previous section, a reduced or optional MCL can be seen to fair equally well under failure scenarios where a participant is already at their trading limit. However this assumption is not always true. A variety of failure scenarios exist where the participant has not reached their trading limit, and the additional buffer provided by the MCL acts to reduce the risk of the prudential margin being inadequate to cover liabilities during the reaction period.

4 FOA Model Formulation

4.1 Comparison of Model 1 and 2

Referenced in Sections: 1.3.3, 4.2, 6.3.2

The report compares Model 1 and 2 in the following qualitative ways:

- A finding that Model 2 most closely matches the cash flows under a futures agreement
- Stakeholder consultation that unanimously supported Model 2

Although these qualitative factors are useful in comparing the models, the report does not provide any quantitative analysis from which to draw a solid conclusion about the effectiveness of the models.

4.2 Systemic risk

Referenced in Sections: 4.3.2

The report discusses the systemic risk that is introduced by any differences between the spot and futures prices. The analysis is based on the degree to which the accumulating futures price and accumulating spot price are correlated, measured using a regression analysis. The results indicate an R^2 value of 0.94 – 0.96, which would indicate a high level of correlation. The mechanism for performing this comparison (accumulating values) does not appear to represent the actual way in which a daily margining model would operate, and therefore it is questionable as to whether the regression values have any relevance to the risk.

The diagrams below show a comparison of futures price and average spot price. The spot price has been averaged over the true outstandings period, as this most closely represents the exposure of a participant to a spike in prices.

Figure 5: Comparison of Futures Price to Average Spot Price (NSW)

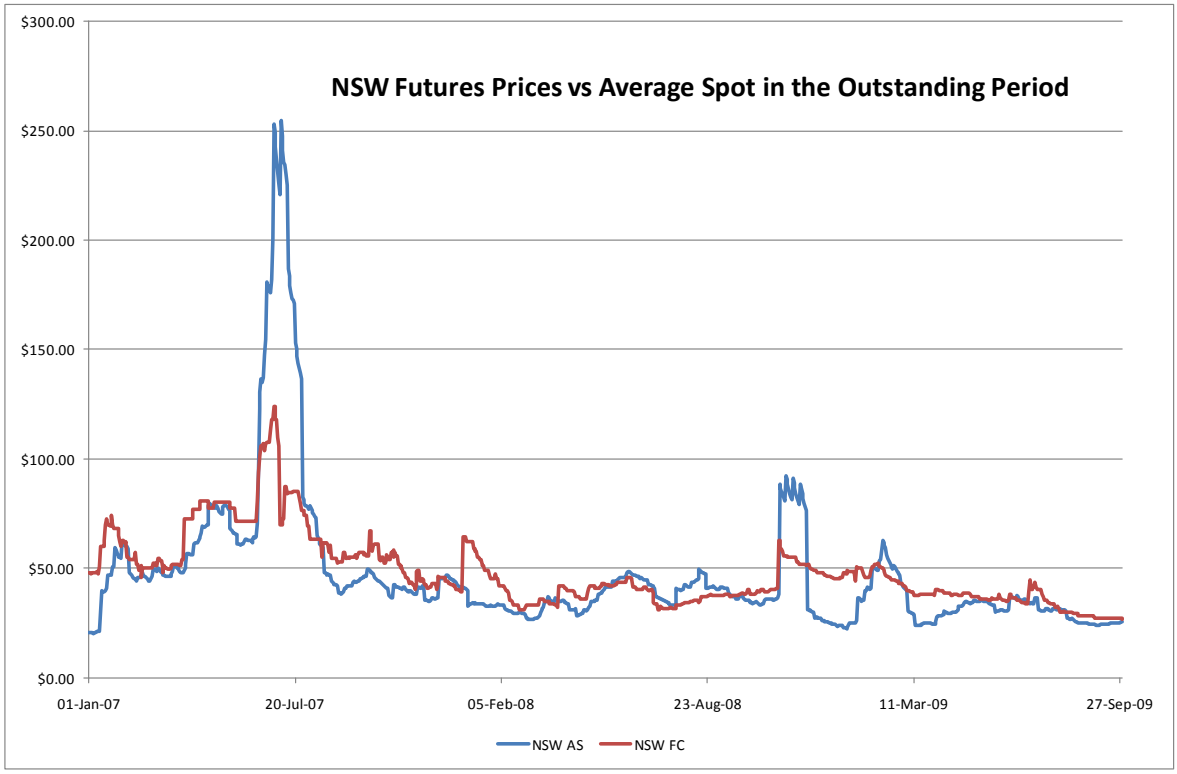


Figure 6: Comparison of Futures Price to Average Spot Price (QLD)

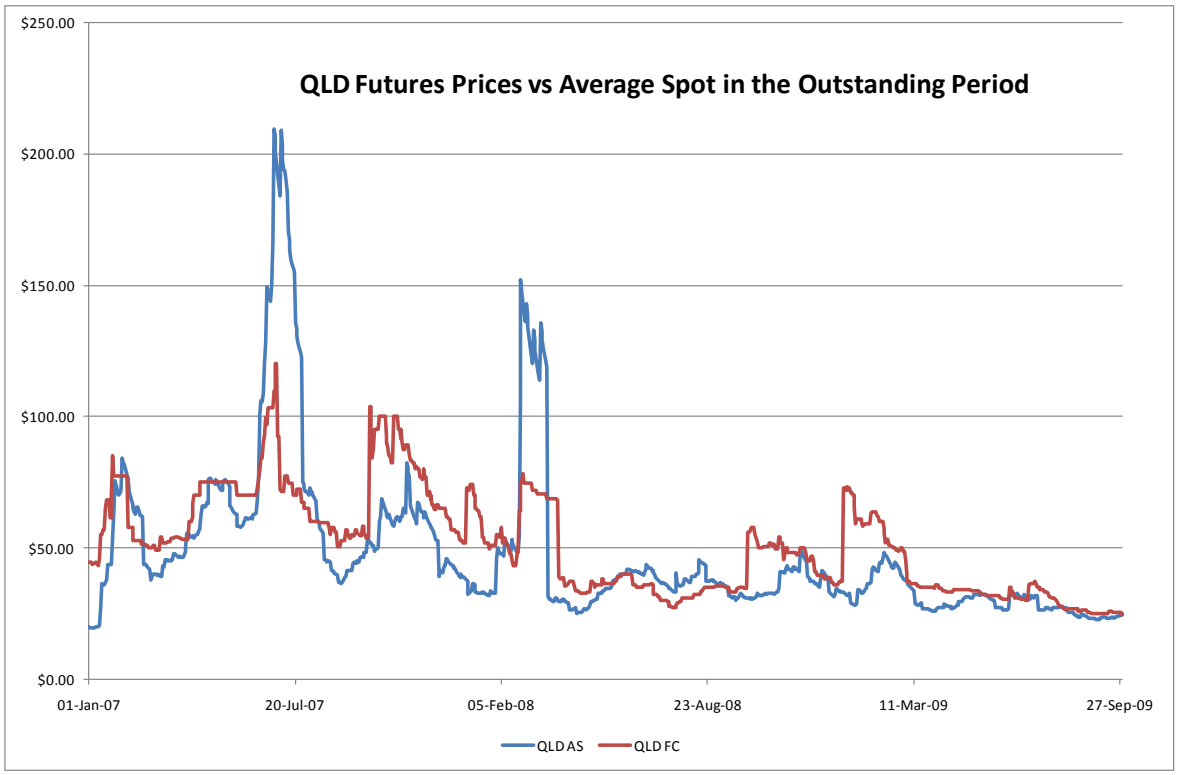


Figure 7: Comparison of Futures Price to Average Spot Price (SA)

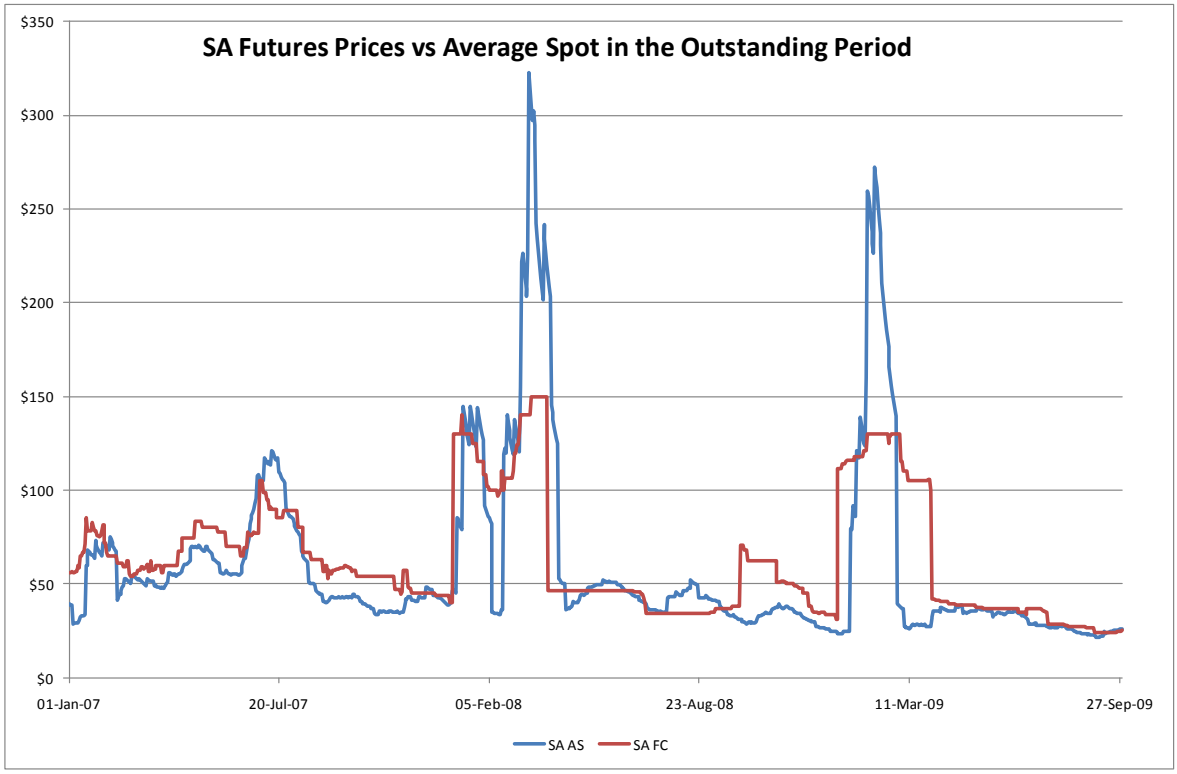
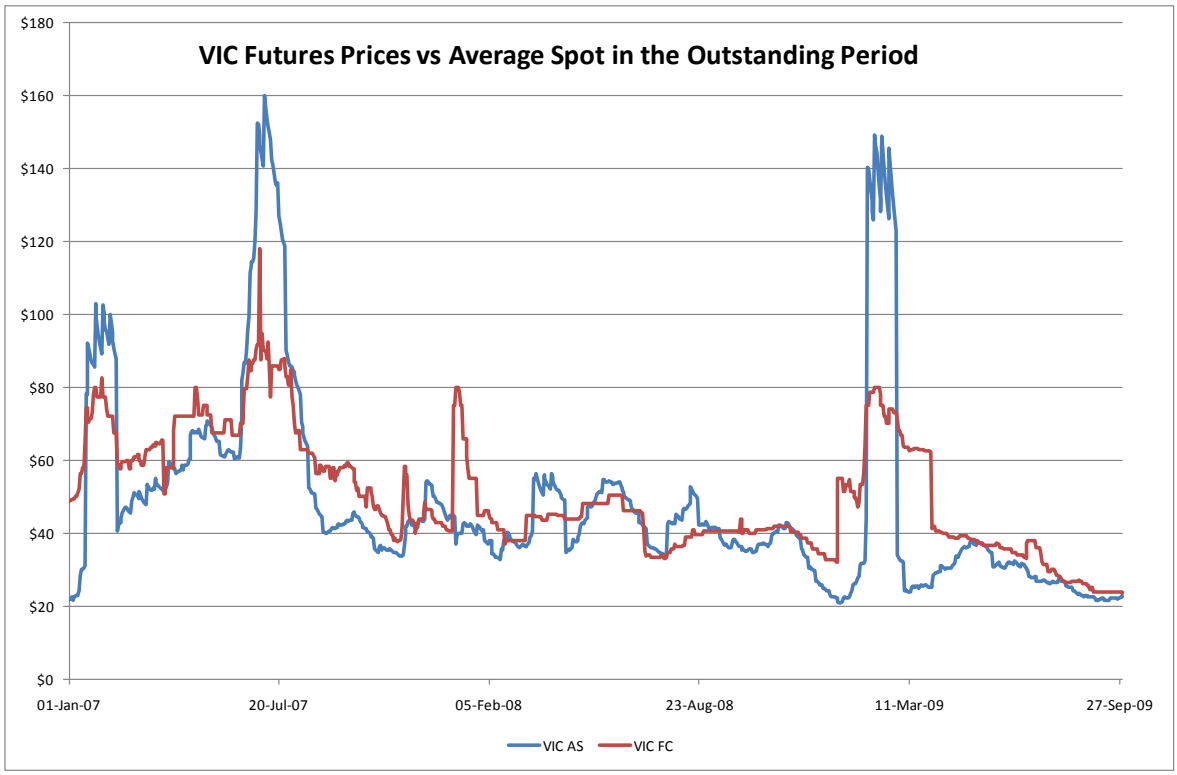


Figure 8: Comparison of Futures Price to Average Spot Price (VIC)



The graphs indicate that although there is some degree of correlation, there are a number of factors that make a direct regression analysis not valid:

- The evaluation period of outstandings and futures contracts is different. The report attempts to avoid this issue by formulating an accumulating spot and futures price over the futures contract; however this removes any relevance to the outstandings period which is the period of the prudentials being managed.
- Spikes in spot price do not translate to an equivalent increase in futures price. Due to the period of futures contract
- There are movements in futures price which do not correspond to a change in spot price

An enhanced form of analysis would be one that assessed systemic risk as a direct modelling of the cash flows under various FOA scenarios.

4.3 Floor on the Variation Margin Payment

Referenced in Sections: 1.3.3, 4.3.2

The report addresses a risk that the futures price may not correlate to the spot price by introducing a floor in the Variation Margin Payment, i.e. the term AS is included in the formulation of the PwC Model. This has the effect of creating a cash flow in cases where the spot price has increased but the futures price is unchanged.

In reviewing this approach, it would appear that scenarios can exist where the cash flow required under the Variation Margin Payment may exceed the funds provided by the Futures Margin Payment. This suggests that the Retailer would need to fund this independent of the FOA. Consequently this cash flow is no different to a voluntary SDA used to preserve the Prudential Margin, and is an unfunded cash flow.

4.4 Pro-rating of Futures Payment

Referenced in Sections: 4.3.2

The formulation of PwC Model includes a pro-rating factor of OP/DQ, where:

- OP is the days in the outstandings period as applied in the MCL calculation (i.e. 35 or 21)
- DQ is the days in the Futures quarter

This formulation appears to impair the ability for a Futures Margin Payment to be used to cover a spike in spot prices. The rationale for this formulation is based on the degree to which MCL relief is provided, which is proportional to OP.

The premise on which the formula is constructed appears to be inconsistent with the current application of MCL to reallocations. Where a participant has a reallocation, the entire value of reallocations is applied during the daily monitoring process, however the participant is only provided MCL relief based on the credit period minus the reaction period (35 or 21 days). This is because the MCL is determined ex ante, whilst the daily monitoring is ex post.

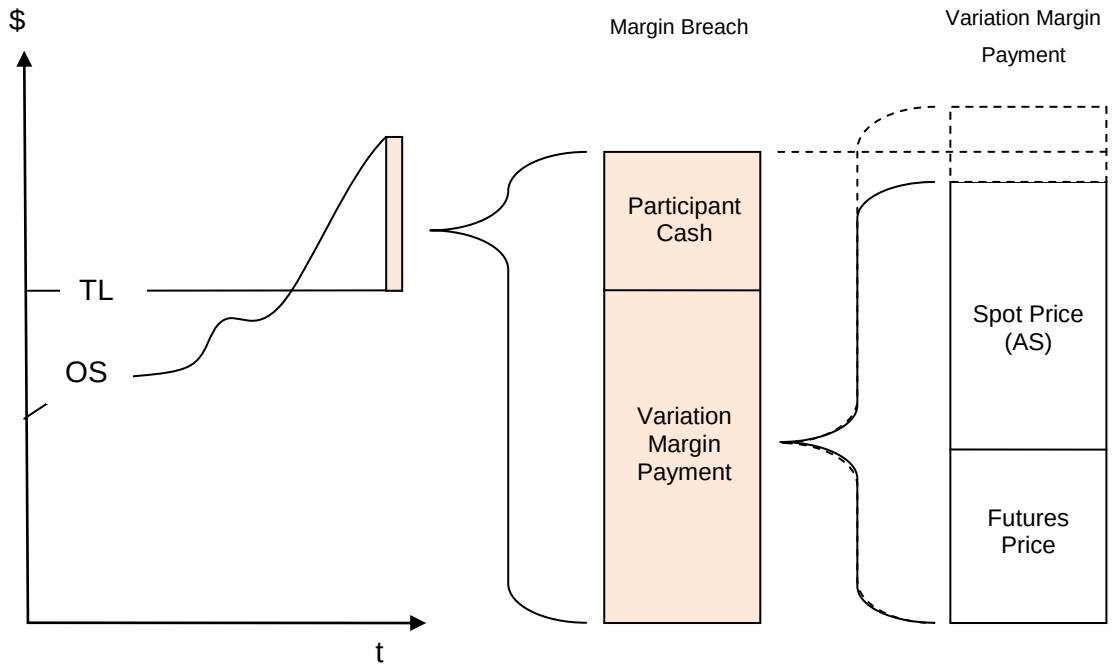
The approach of reducing the ex post Variation Margin Payments in accordance with the ex ante MCL relief introduces an additional risk in the daily monitoring process.

4.5 Cash build up of PwC Model

Referenced in Sections: 4.3.2

The formulation of Variation Margin Payment has been adjusted in the PwC Model to include a factor representing the spot price and to prorate the amount by the proportion of outstandings period over the futures quarter. The diagram below is intended to graphically represent the relationship between each component.

Figure 9: Cash build-up of Trading Margin payment under the PwC Model



- Variation Margin Payment represents the amount calculated as per the PwC Model
- Margin Breach represents the amount by which the Retailer has breached their Trading Limit (i.e. Trading Margin).
- Participant Cash represents additional cash that may need to be provided by the Retailer (by 10:30am) in order to reduce their Outstandings to below their Trading Limit. This would occur if the Variation Margin Payment was less than the Margin Breach.

5 FOA Model Analysis

In order to analyse how the proposed FOA mechanisms work in practise it is necessary to make several assumptions. Unless otherwise stated, the following is assumed.

- The MCL is not reduced and has a credit period of 42 days.
- The MCL does not change during the quarter and is based on the most recent MCL data prior to the quarter start.
- A perfect settlement cycle is modelled with the outstanding period ranging from 26 to 32 days, assuming no public holidays.
- The FLP is taken to be the Futures Contract price occurring 28 days prior to the first business day of the quarter.
- The load covered by Futures Contracts is 50% of that load utilised in the MCL calculation (to the nearest whole contract).
- Each quarter exists, and is modelled, independently of each other excepting the daily outstandings position which includes all days yet to be settled.
- Where the concept of AS is utilised the prices averaged are those within the current outstandings period which are also within the current quarter.
- Where the credit period is 42 days the PwC outstanding period (OP) is 35 days, where the credit period is 28 days the PwC outstanding period (OP) is 21 days.
- Where resets are permitted these occur at all times where the Trading Margin >0. The amount of reset is capped by the Trading Margin available.
- Where it is unclear how to manage a positive differential between DSPt and FLP on business day one of the quarter (PwC model) a cash payment has been assumed to make up for any shortfall between the payment required and the margin on that day.

5.1 The PwC Model

The PwC Model includes resets, an OP/DQ factor on margin payments and an accumulating spot price for the outstanding period. It is represented by the following equation:

Variation Margin Payment = Max[(Max[DSPt,AS]-Max[FLP,DSPh])xFQx(OP/DQ),0]

In order to illustrate how the cash flows for such a model might work the following has been graphed (below) for a selection of years and regions

- The daily positive Futures Margins received under a single contract (24 MWh/day)
- The incremental outstandings accumulated on 24 MWh of load the day prior to the margin payment (Yesterday's OS)
- The cash flow from both the Futures Margin Payments (FMP towards VMP) and that sourced directly from the Participant (Cash towards VMP) which flows from PwC's Variation Margin Payment equation (see above) for a single contract. (These two cash flows are presented as a stacked column.)

Note in each of the following graphs, the red bars represent the unfunded component

Figure 10: Daily Outstandings, Futures Margins and Variation Margin Payments for NSW 2007

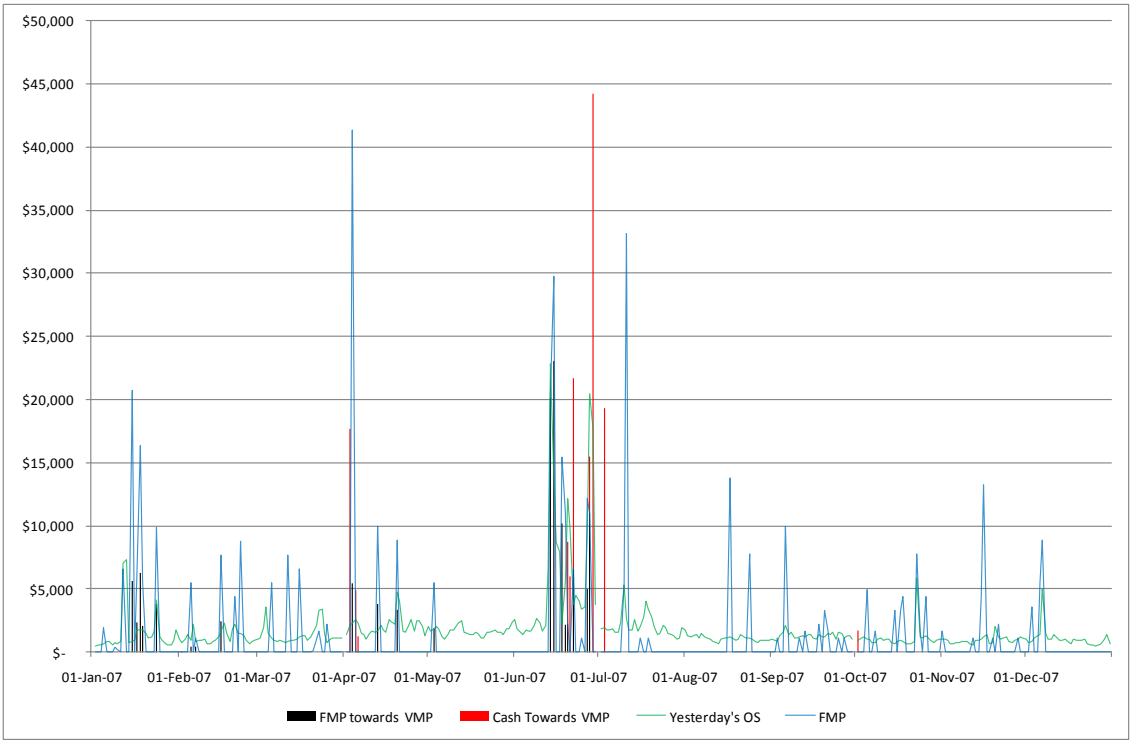


Figure 11: Daily Outstandings, Futures Margins and Variation Margin Payments for SA 2008

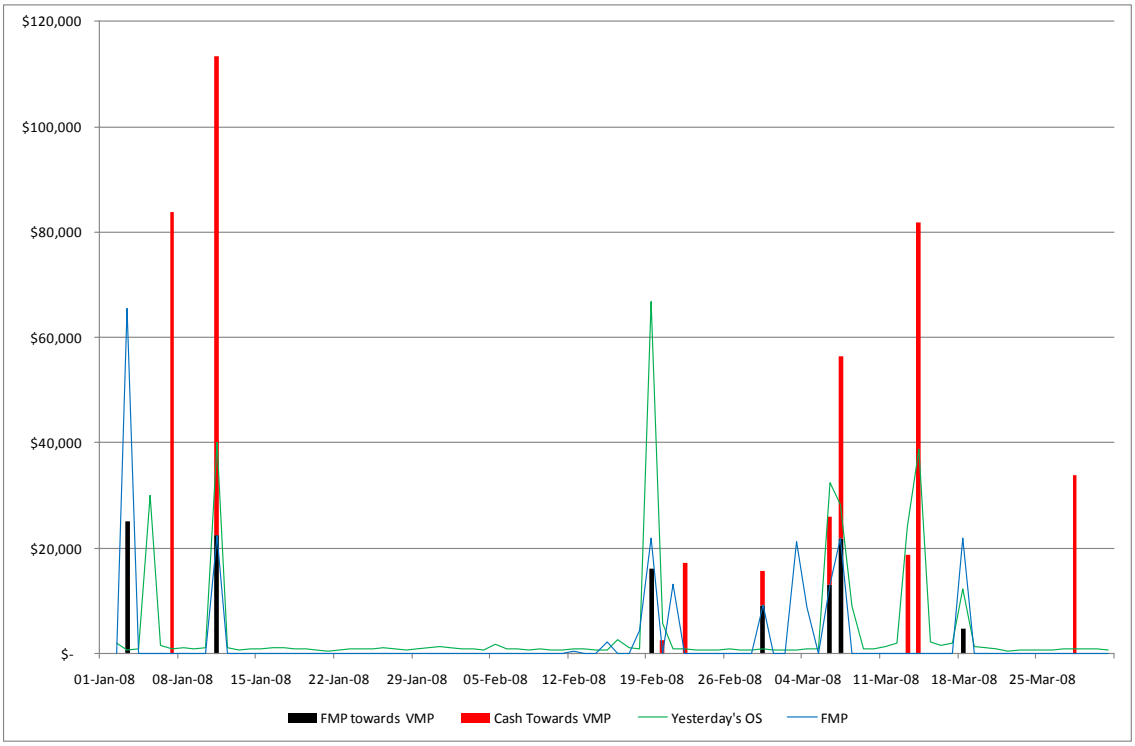


Figure 12: Daily Outstandings, Futures Margins and Variation Margin Payments for SA 2009 Q1

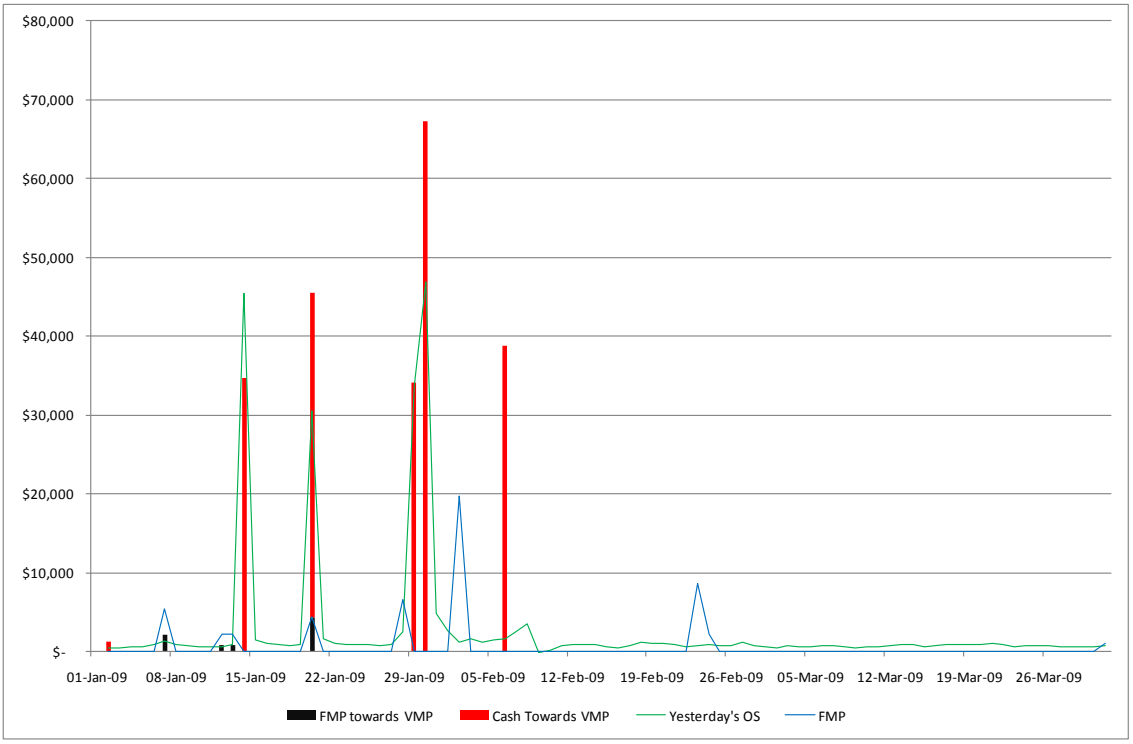
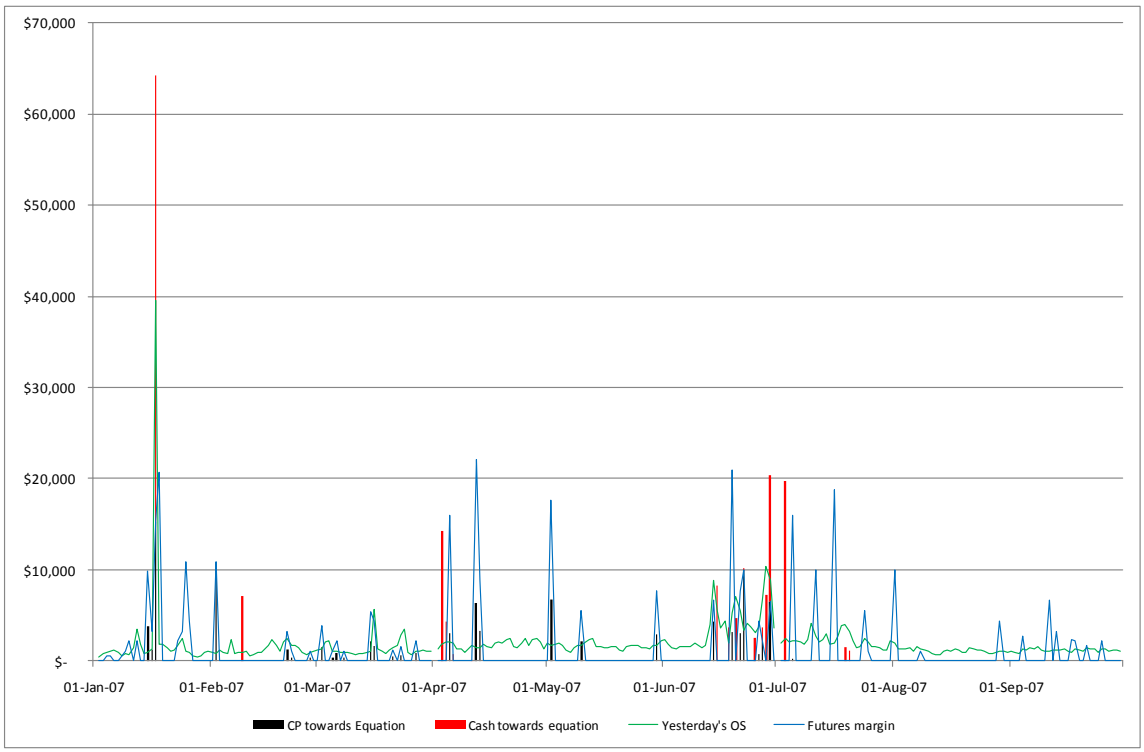


Figure 13: Daily Outstandings, Futures Margins and Variation Margin Payments for VIC 2007 Q1-Q3



The following observations can be made from these graphs:

1. On a day to day basis, Variation Margin Payments (VMPs) do not always correlate with Futures Margin Payments (FMPs). This can result in all of the VMP being funded directly from the Participant (red column).
2. When a VMP occurs with a corresponding margin payment the full FMP is often inadequate to cover the VMP (black and red column stacked).
3. On a day to day basis, Futures Margins (blue line) do not necessarily correlate with spikes in the level of outstandings indicative of the fact that the Futures market is not always moving in sync with the physical market.
4. In the early days of a quarter 'AS' is averaged over significantly less than the 26 to 32 day outstanding period. This leads to large increases in AS with a single day's price spike. The result of which is a large VMP typically sourced in the main directly from the participant (red, black/ red columns).
5. As the outstandings period shifts a week on a settlement day variations to AS occur which can lead to the requirement for a VMP, again with no supporting FMP (red columns on a Friday).

5.2 Performance of the Futures Offset Arrangements

In order to assess the effectiveness of the range of FOAs modelled a series of graphs have been plotted providing the frequency of days on which a given level of cash from the Participant was held in order to stay within the Trading Limit or to meet the needs of the VMP (PwC model). This is the additional unsecured cash provided by the Participant, i.e. cash which does not originate from a Margin Payment.

The amount of cash held (x-axis) is graphed as a proportion of the Trading Limit of the 'no FOA' case. Each model spans the timeframe Q1 2007 to Q3 2009 inclusive. The cumulative frequency is given as the percentage of days out of the total of 1004 days which had cash up to the correlating value held in security deposit. For example, if the 'Cum. Frequency' on a graph for a 200% 'Cash in Security Deposit / TL' is 95% then 5% of days require more than 200% of the TL to be held in Security Deposit. In order to understand the spread of outcomes a number of Participants (large and small) have been modelled.

The three FOA models presented in the Figures 6 to 13 are the PwC model which includes a reset mechanism, model 1 which has no reset and holds onto the full margin payments until the outstanding period to which they relate is settled, and the no FOA case.

Figure 14: Cumulative Frequency of Cash Levels held for Participant A in NSW

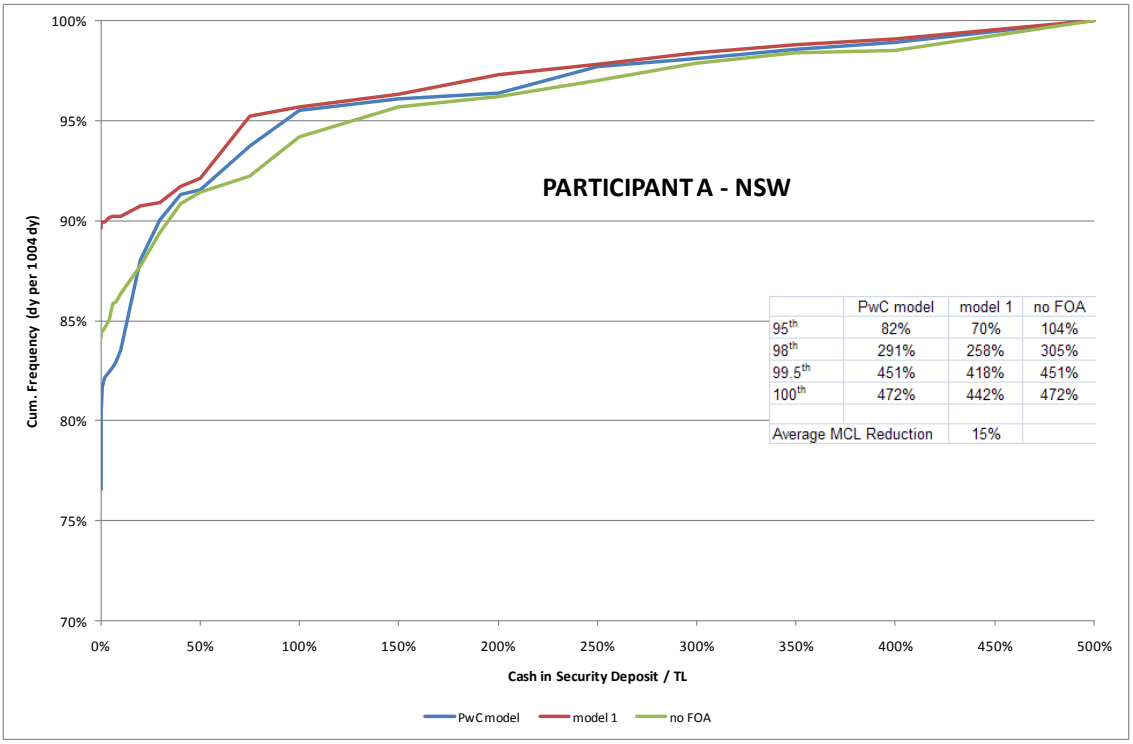


Figure 15: Cumulative Frequency of Cash Levels held for Participant B in NSW

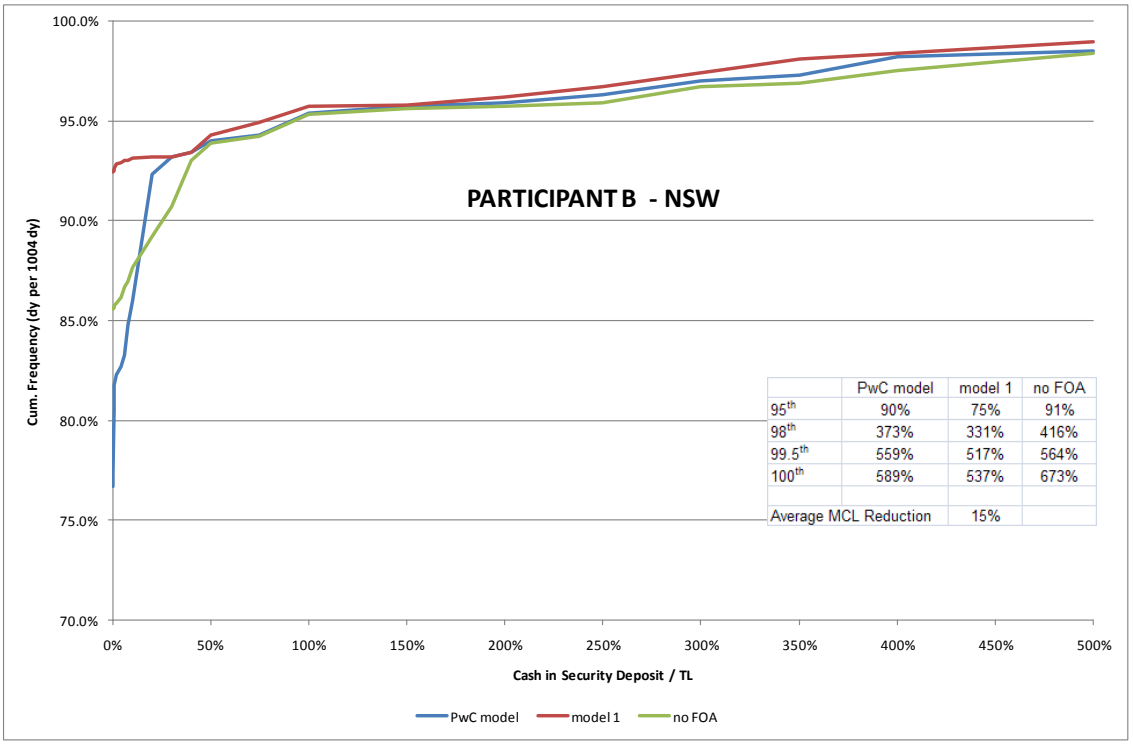


Figure 16: Cumulative Frequency of Cash Levels held for Participant C in QLD

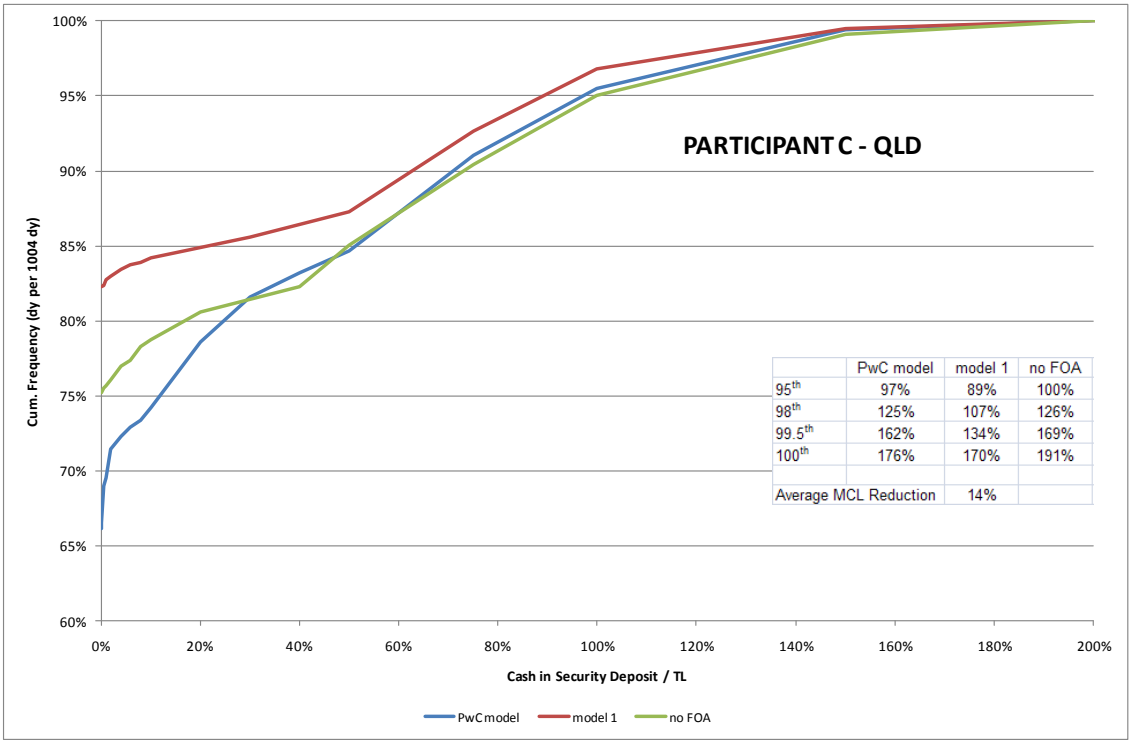


Figure 17: Cumulative Frequency of Cash Levels held for Participant D in QLD

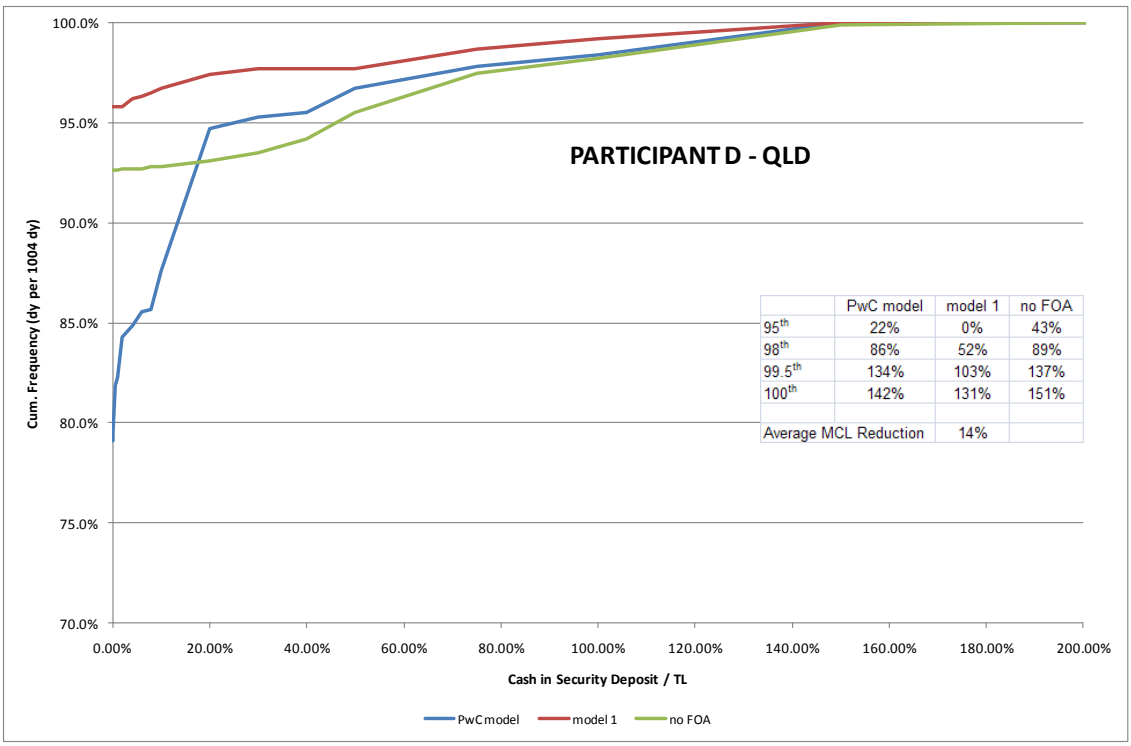


Figure 18: Cumulative Frequency of Cash Levels held for Participant E in SA

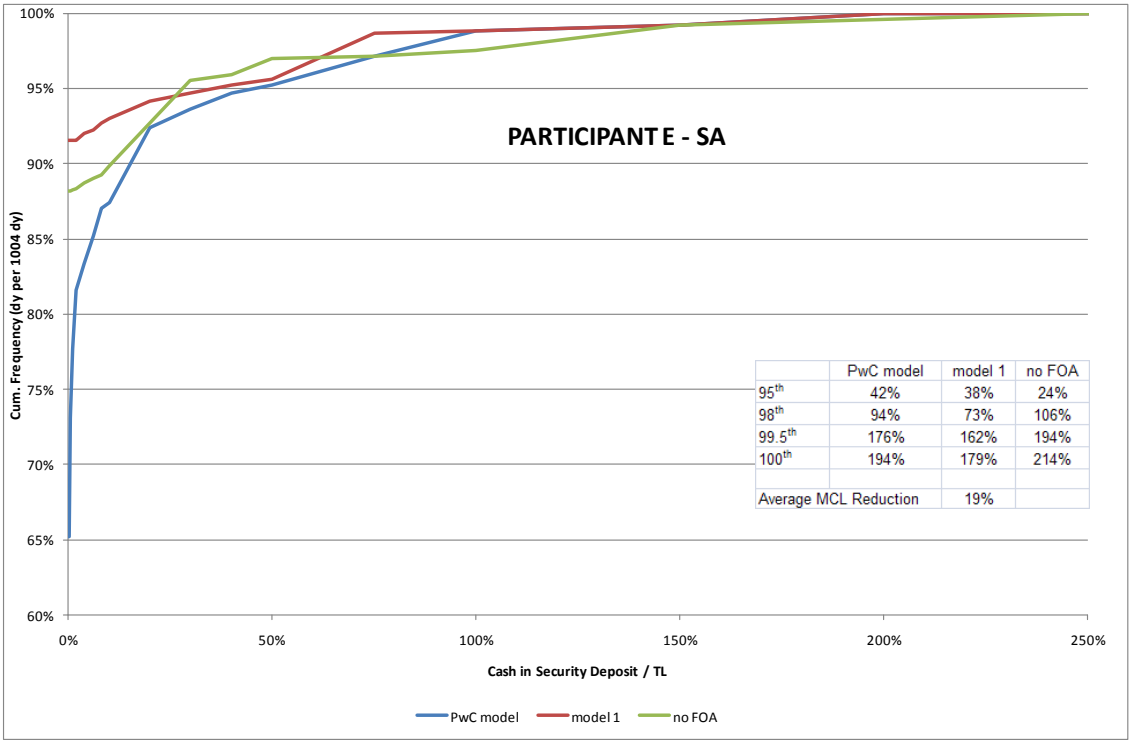


Figure 19: Cumulative Frequency of Cash Levels held for Participant F in SA

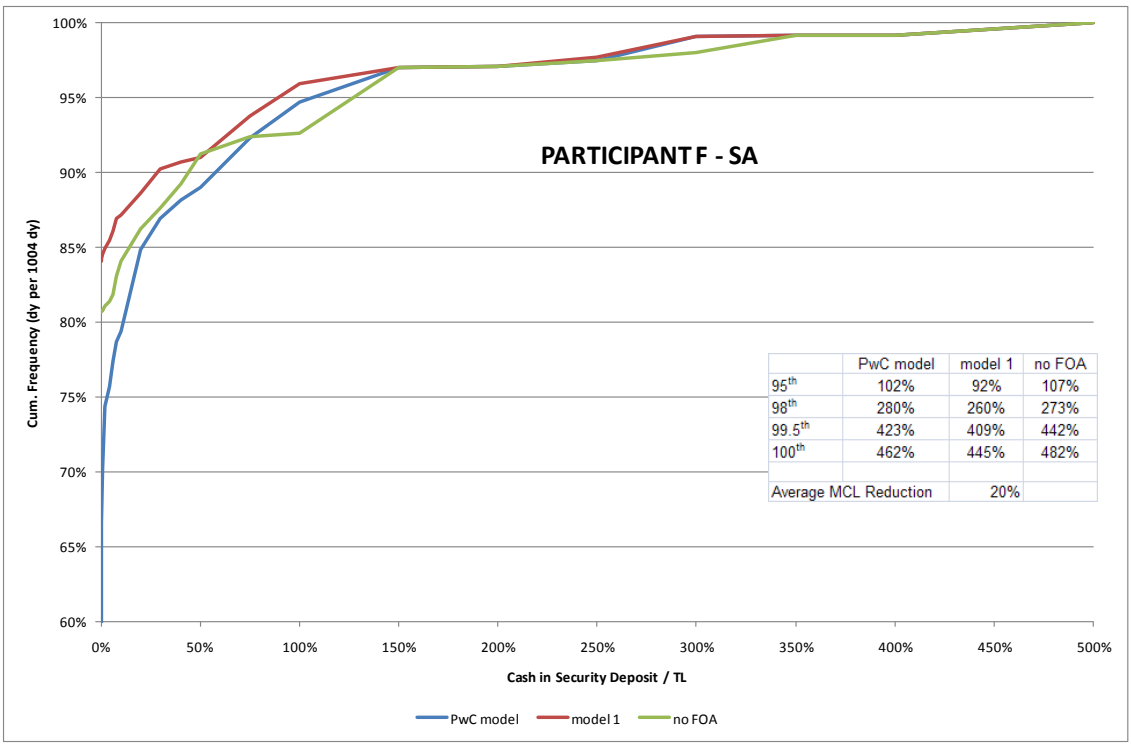


Figure 20: Cumulative Frequency of Cash Levels held for Participant G in VIC

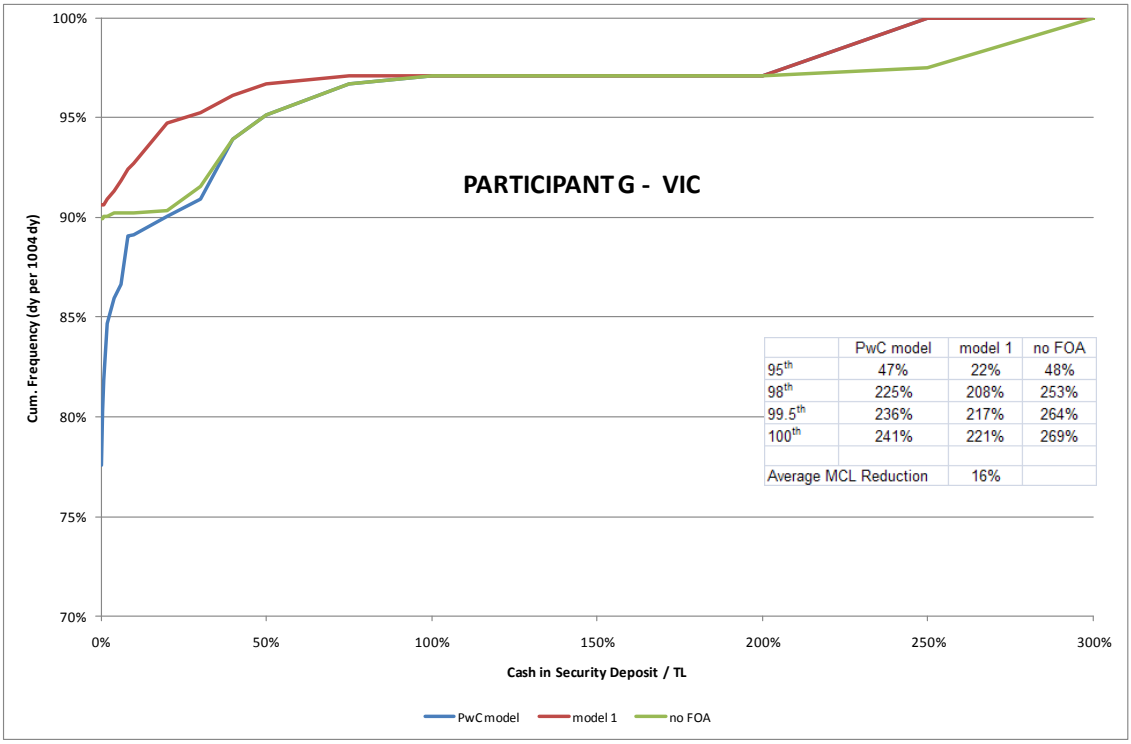
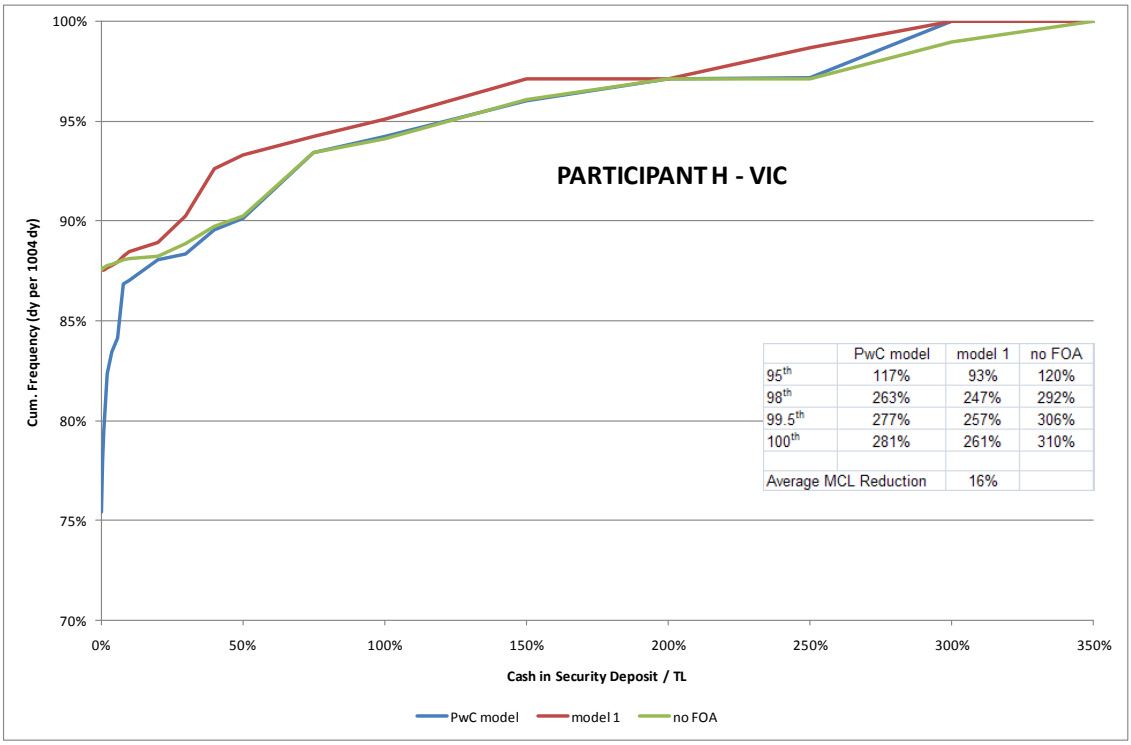


Figure 21: Cumulative Frequency of Cash Levels held for Participant H in VIC



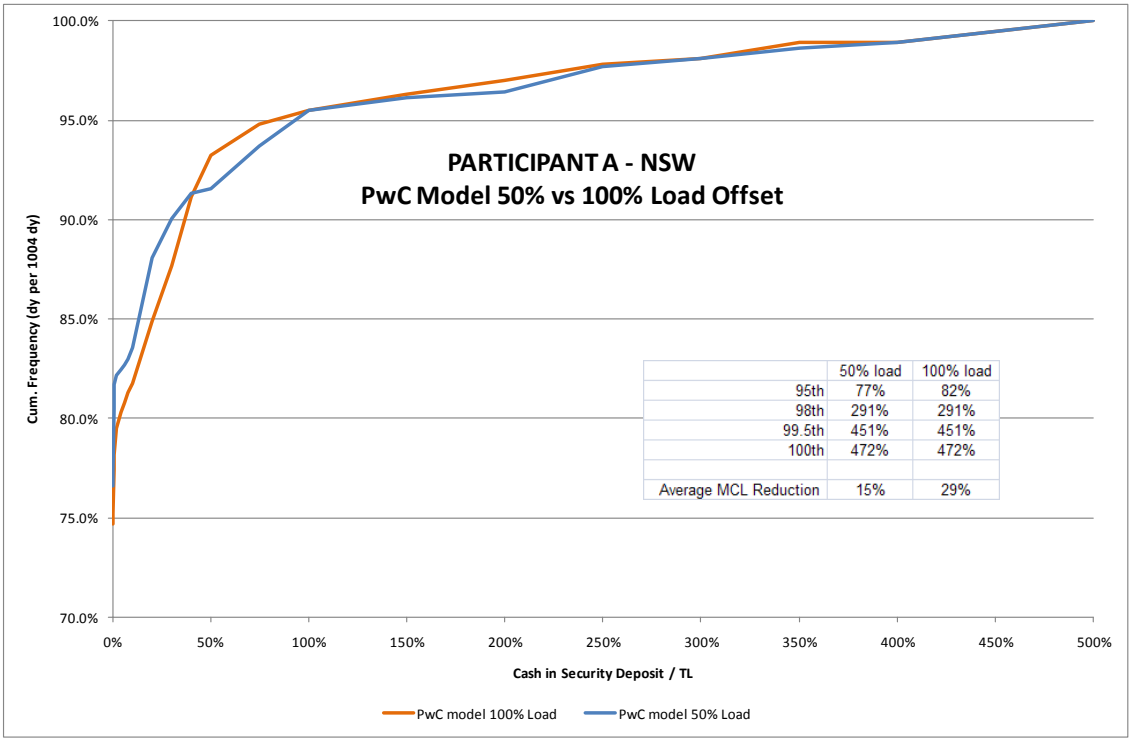
As might be predicted from the graphs above the PwC model is the poorest performer at the lower levels of cash held. This is due, in the main, to the VMPs required under the PwC model for which there are inadequate or no correlating Futures Margin Payments. As the 'Cash in Security Deposit / TL' value increases the performance of the PwC model increases to a level commensurate with model 1. In these instances the full FMP is being made. These scenarios, where the amount of cash held is in excess of the trading limit, are brought about by extreme high pricing events for which all the MCLs are proving inadequate. However, the existence of an FOA is going some way to mitigate these events by providing FMPs which cover some of the Trading Limit breach.

The following sections show how additional scenarios can affect the performance of the FOA models. The variance has been performed against Participant A NSW.

5.3 100% Load Offset

The graph below illustrates that an increase in the load offset to 100% of the load used in the MCL calculation increases the requirements for cash payments against the PwC model VMP equation at lower 'Cash in Security Deposit / TL' levels. As the VMP equates to the full Futures Margin Payments with the more extreme pricing events then the 100% Load under Futures Contracts has a roughly equivalent mitigating effect than the 50% Load scenario.

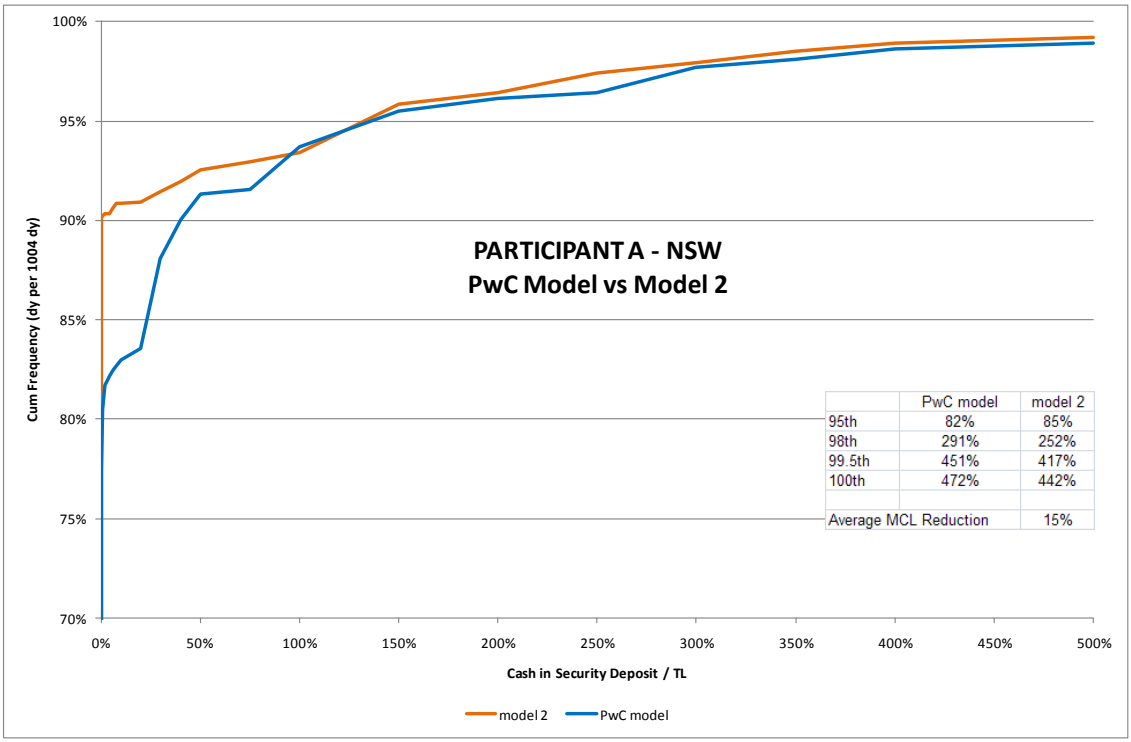
Figure 22: 100% Load Offset Variance Analysis



5.4 Model 2 vs PwC Model

The graph below compares the original Model 2 against the PwC Model.

Figure 23: PwC Model vs Model 2

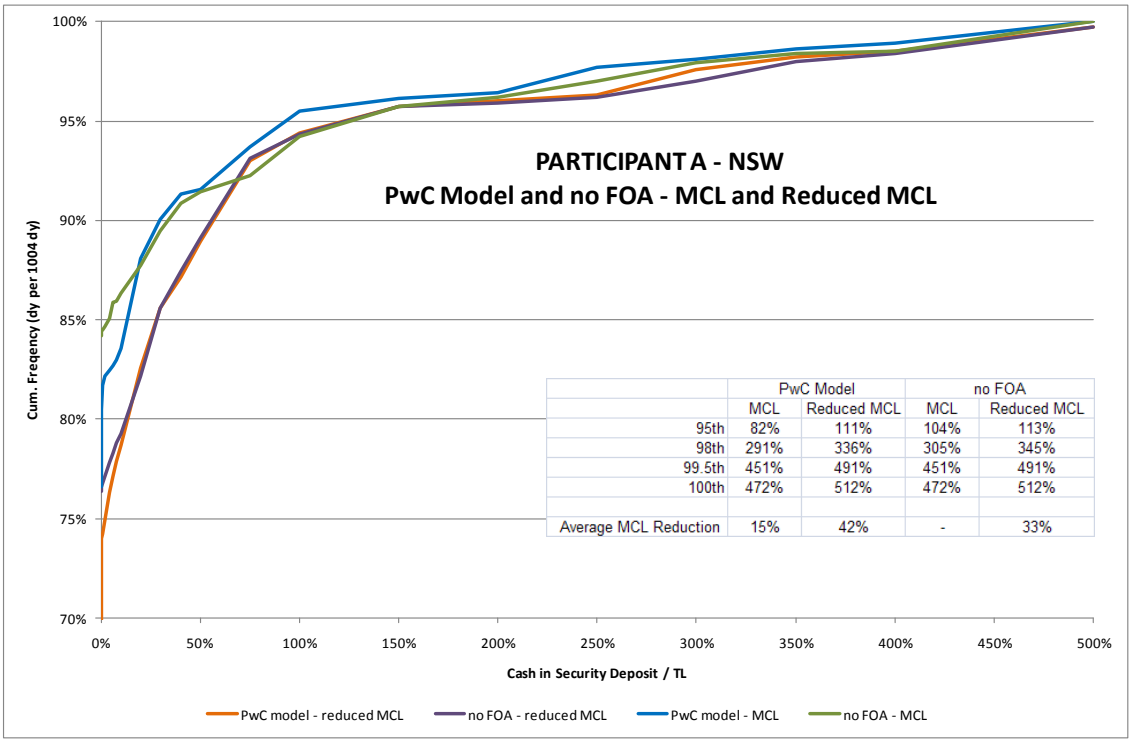


The graph shows that Model 2 is generally more effective than PwC Model. Model 2 also prevents small additional Margin Payments being made due to spurious changes in AS.

5.5 MCL vs Reduced MCL

The graph below shows the effect of reduced MCL on both the PwC Model and no FOA.

Figure 24: PwC and No FOA vs PwC and No FOA with Reduced MCL



	PwC Model		no FOA	
	MCL	Reduced MCL	MCL	Reduced MCL
95th	82%	111%	104%	113%
98th	291%	336%	305%	345%
99.5th	451%	491%	451%	491%
100th	472%	512%	472%	512%
Average MCL Reduction	15%	42%	-	33%

This graph illustrates that the reduced MCL scenarios are less effective than the MCL scenario for both the No FOA and PwC model. In addition, the PwC model is less effective with respect to the no FOA model under the reduced MCL scenario. This is due to the OP value now being 21 as opposed to 35 in the MCL VMP equation which has the effect of decreasing the magnitude of any VMPs. This factor is compensated to some degree by the smaller reduction in credit limit from application of an FOA which occurs under a reduced MCL scenario.

5.6 Findings

Based on the qualitative and quantitative analysis that AEMO has performed, the following findings have been made:

- As a result of their potential performance during high pricing events, all FOAs are considered to offer benefit in managing prudentials in comparison to no FOA. Model 1 is considered the most robust FOA with the PwC model being the poorest performer.
- There is a clear level of systemic risk in the PwC model due to the disconnect between the Variation Margin Payment (VMP) and the underlying Futures instrument. This leads to VMPs being required where no, or inadequate levels of, Futures Margin

Payment (FMP) are available. Thus a greater frequency of non-FMP cash flows is generated when the participant is not in breach.

- As a consequence of the systemic risk described above, the PwC model is the poorest performer at the lower levels of cash held. This results from the participant making cash payments in order to meet the VMP in cases where the FMP is inadequate. Compared to model 2, extra cash from the participant is also required in instances where the Trading Limit breach is increased as a result of the OP/DQ scaling in the VMP equation.
- As the Trading Limit breaches increase, and are typically accompanied by increases in the Futures Prices as well as AS, the performance of the PwC model increases to a level commensurate with model 2. In these instances the VMP equation results in a requirement for the full FMP (and more) to be made. These scenarios, where the amount of cash held is in excess of the trading limit, are brought about by extreme high pricing events for which all the MCLs are proving inadequate. However, the existence of an FOA tends to go some way to mitigating these events by providing FMPs which assist in managing the Trading Limit breach.
- There is the clear potential for a reset mechanism to allow the participant to operate more frequently on their Trading Limit than they otherwise would if they did not have an FOA. This outcome needs consideration when making assessments of the impact of FOA termination risk.

The following observations underlie our findings

- In order to understand the risks and issues with any FOA it is necessary to assess, ie to model quantitatively, the daily operational performance of each model. In this way the cash flows generated from the available Futures Margin Payments, and how these relate to the reduction in MCL which the model has afforded, can be understood.
- The FOA has to be considered in the context of the NEM settlement calendar and rolling outstandings periods. The correlation of movements in the Futures Prices to the average spot price (AS) within these outstandings period are a basic element in determining the success of an FOA in practice.
- A comparative analysis of the performance and potential risks associated with the operation of each model is necessary in order to make any recommendation on which will work best in practice.
- Any comparative work should encompass scenario analysis. Each model has a significant number of variables (eg FLP, Load offset, MCL vs Reduced MCL) the impact of which needs to be understood.

In assessing the PwC model in particular the following findings have been made

- The Variation Margin Payments are frequently not supported by actual Futures Margin Payments.
- The VMP suffers inappropriately from the exaggerated weighting of movements in spot price early in a quarter due to the low number of days over which averaging

occurs to derive an ‘AS’ value. This leads to an increased requirement for Variation Margin Payments that are not supported by Futures Margin Payments.

- Every settlement day (Friday) a week’s worth of average prices disappear from the calculation of the AS in the outstandings period. The length of the oustandings period also shrinks from 32 to 26 days. This can lead to a jump in the value of AS with a commensurate need for Variation Margin Payments which are not supported by Futures Margin Payments.
- The PwC model has only been loosely defined within the report. Modelling this FOA has highlighted the need for clarity in the way the beginning and end of the quarter are to be dealt with operationally for all FOAs. This should include any mechanism by which one quarter transitions into the next.

6 Reasonable worst case interpretation

Referenced in Sections: 5.1, 6.3.3

6.1 Statistical analysis

In reviewing the interpretation of reasonable worst case, the report uses a statistical approach to understanding this metric. It is proposed that a 98th percentile or 99.5th percentile could be chosen to achieve this.

It is critical to understand that the key issue in using this approach is the underlying value that is used. For example, taking the 98th percentile of half-hourly prices would consequently ignore all prices that occur less than 2% of the time, which is roughly prices greater than $300. It would seem imprudent to do this, as the primary benefit of RA's and FOA's are to reduce the exposure in the NEM to prices greater than $300.

The report does not clarify what the underlying value would be, only suggesting it is the "pricing information from the evaluation period"

The diagrams below represent the top few percentile of cumulative frequency distribution of pricing information using an evaluation period of trading interval, daily, and weekly.

Figure 25: Trading Interval Cumulative Frequency Distribution (top 2nd percentile)

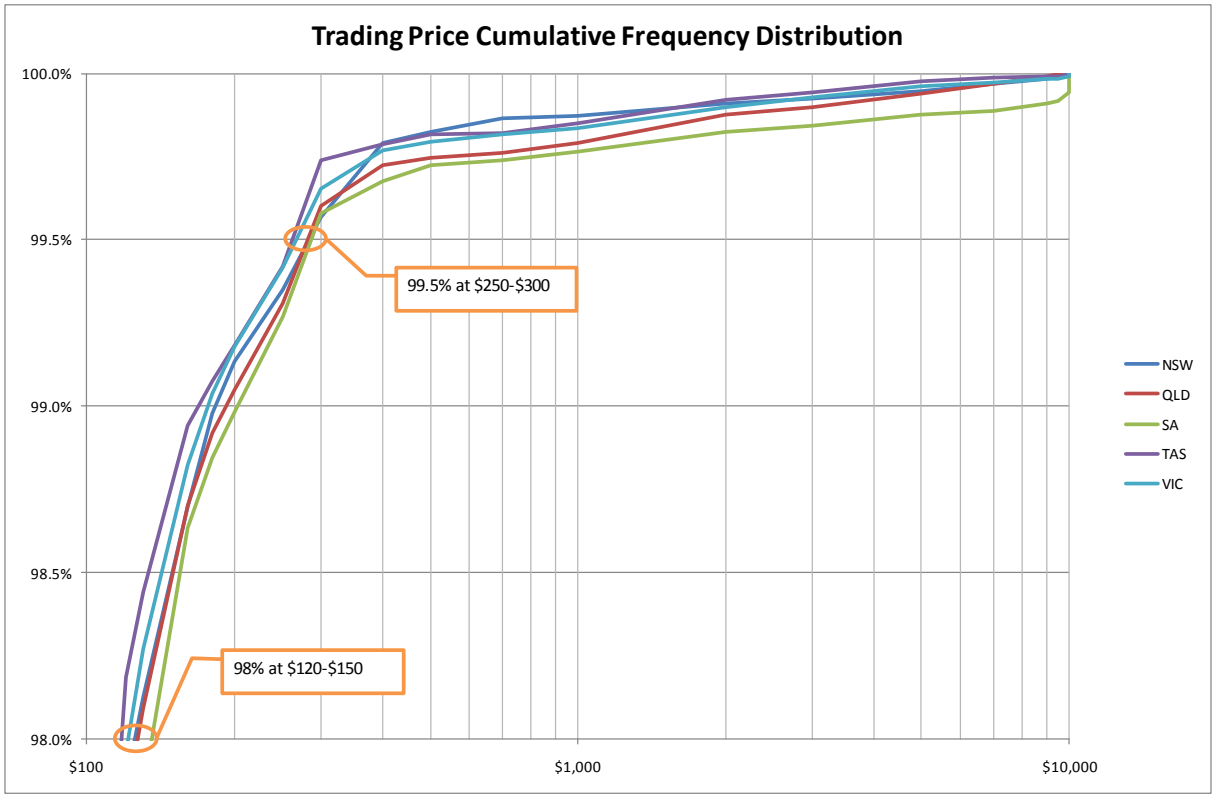


Figure 26: Daily Cumulative Frequency Distribution (top 2nd percentile)

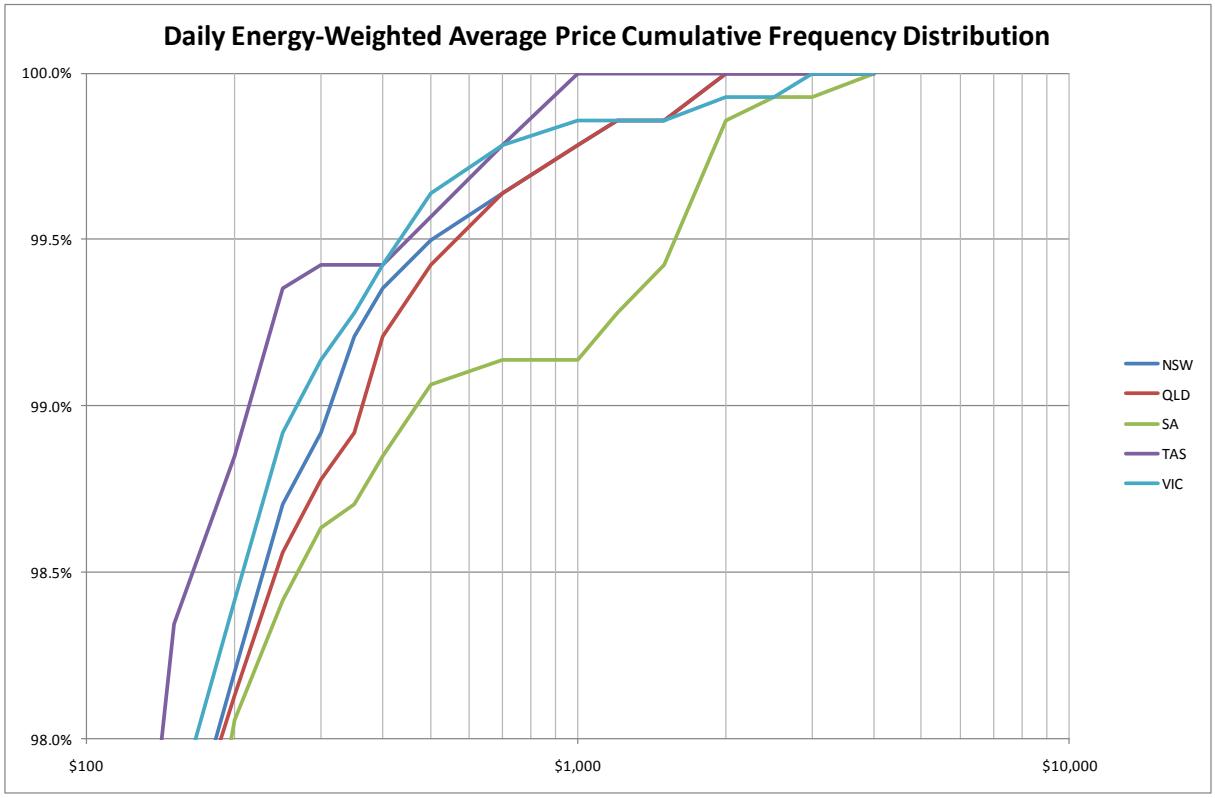
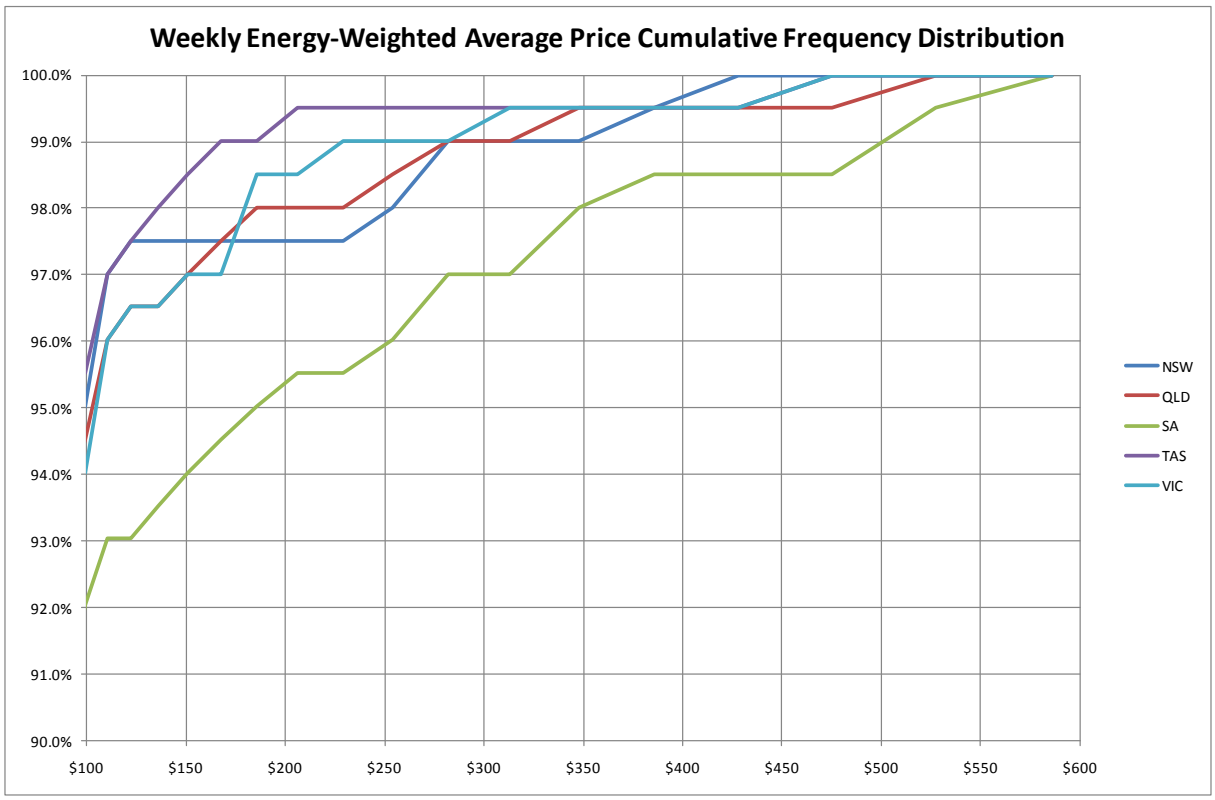


Figure 27: Weekly Cumulative Frequency Distribution (top 10th percentile)



As an example, the 98th and 99.5th percentile prices for SA are:

Table 3: Average price in 98th and 99.5th percentile (SA)

	98TH PERCENTILE	99.5TH PERCENTILE
Trading Interval	$135	$296
Daily Average (energy weighted)	$195	$1,533
Weekly average (energy weighted)	$345	$513

Based on the data above, any statistical interpretation of reasonable worst case would need to reference the evaluation period (i.e. trading interval, daily, weekly), in addition to the confidence interval (e.g. 98%, 99.5%)

6.2 Distribution of prices

A key attribute of prices in the NEM is that they are not randomly distributed. Market behaviour has shown that high prices tend to be grouped together during periods of high demand (which tend to correlate to outside of normal weather conditions). Consequently the impact on prudentials is generally more extreme that a purely statistical model would derive.

The current calculation of volatility factor attempts to address this issue, by modelling the greatest 42 days outstandings over an observation period. A statistical interpretation such as

that discussed in the PwC report may not effectively represent the extreme pricing conditions that can occur.

However models such as the Stress Test Methodology (Admin MCL) would be effective in representing extreme pricing.

6.3 99.5th percentile

The use of a 99.5th percentile (instead of the 98th percentile) as suggested by the AEMC was discussed and reported as seriously impairing efficiency. There would seem to be a need for quantitative analysis in this area before a conclusion on the combined impact to effectiveness and efficiency can be drawn.

7 Load-related factors

7.1 Peak/Off-peak disparity in RA process

Referenced in Sections: 3.2.6

The report states that:

> "In reviewing the reallocation rules and procedures we have not found any provisions that explain the profiling processes…"

AEMO specifically discussed the process contained in Section 11.7 of the Credit Limits Methodology:

> "AEMO may elect to not consider reallocations where the daily energy profile is significantly different to the profile of load and generation in that region."

AEMO has an operational process which involves the following features:

- Alerting and identification of reallocations with an imbalance of off-peak energy
- Analysis of reallocation and energy profiles to determine any net imbalances
- Exclusion of specific reallocation from the MCL review as required

To date, AEMO has not excluded any reallocations from MCL reviews.

7.2 Load balancing

Referenced in Sections: 4.3.3, 4.6

The report proposes that AEMO adjust the expected average load used in the MCL calculation to cover the added risk of a peakier profile. Whilst AEMO agrees that the risk should be addressed, the mechanism of increasing the average load does not appear operationally practical. Any further analysis will need to consider options, including assessing the average load in peak and off-peak periods separately.

7.3 Load volatility

In addition to the issue raised in regards to load balancing (i.e. a retailer's load tends to have peak which usually correlates with high prices), an equally important issue is the overall increase in load that will usually coincide with high prices. This factor tends to be more prevalent for participants with a large proportion of residential customers, where there is a greater volatility of load during high/low demand scenarios.

This load volatility has a large impact on the prudential situation of a retailer, and the adequacy of MCL and prudential margin. In addition to investigating alternatives for addressing load balancing, load volatility should also be investigated. An option is to introduce a load volatility factor, which represents a scaling factor for average load to represent the higher than average load during periods where the price is high.

8 MCL formulation

8.1 Futures price prior to quarter

Referenced in Sections: 5.3.3, 5.5

The report analyses the effectiveness of using Futures Prices taken 5 days prior and 5 weeks prior to the futures quarter. The results indicate there is benefit in taking the Futures Price close to the quarter start.

There are several operational issues with this conclusion, which were discussed in detail with PwC during the consultation. These issues include:

- AEMO is required to perform an MCL review approximately 4 weeks in advance of when the review is effective, to ensure sufficient time for the review to be performed and for participants to arrange credit support.
- AEMO currently performs a routine review of MCL's based on an offset quarter (effective March, June, September, December).
- There would be increased risks associated with credit support being arranged and exchanged during the Christmas period, required for a 1 January effective date.

Based on liaison between AEMO and participants, we have been made aware of several factors that prevent participants being able to arrange new or replacement credit support to align with an MCL change at short notice. These include:

- Participants generally arrange for their existing credit support guarantees to expire on or shortly after the MCL change. This is to reduce the amount of excess credit support held above the MCL, maximising the efficiency for the participant.
- Participants and their banks are frequently unwilling to have both existing and new credit support lodged with AEMO simultaneously, even if the effective periods do not overlap. This is due to the risk of AEMO drawing down on both sets, thereby doubling the exposure of the bank to the participant. This issue is avoided by the bank performing an exchange of credit support on or prior to the original credit support expiry date.
- Due to the above factors, the participant is then required to replace these credit support guarantees at least 10 business days prior (in accordance with NER clause 3.3.6(a)), and in sufficient time to allow for credit support to be executed (typically 1-3 business days).
- A small number of participants have indicated their time to arrange new or replacement credit support guarantees to be in the order of 2-3 weeks.

An option to mitigate these factors would be to change the prudential framework around the replacement of credit support, particularly where an MCL change is effective.

The current AEMO timing for MCL reviews has been based on feedback from participants, specifically to align the quarterly MCL review with the nominal seasons (i.e. March, June,

September, December). The current methodology includes pricing and load information for the previous 12 months, and participants wanted to avoid the pricing information from a Summer period (i.e. December to February) being included in the Autumn period (i.e. March to May). An example of the issue with using calendar quarters is shown below.

Figure 28: Calendar quarters for MCL review

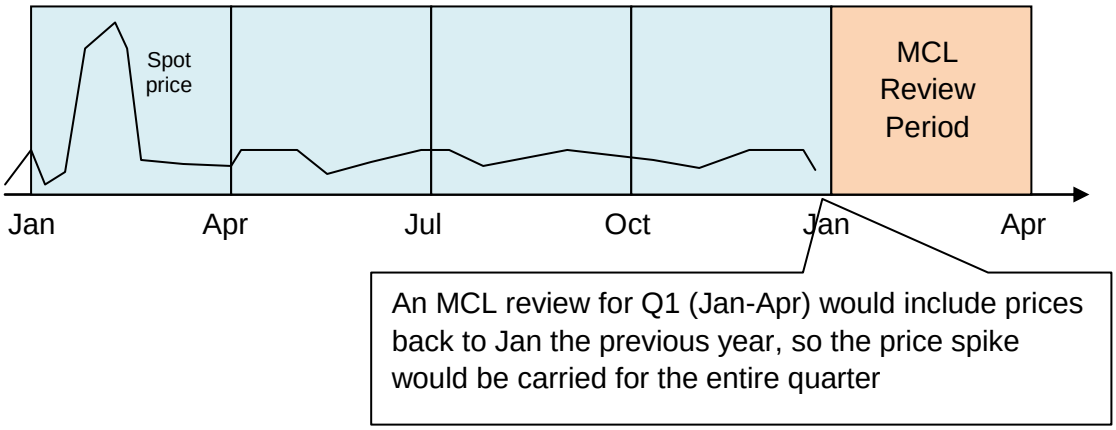
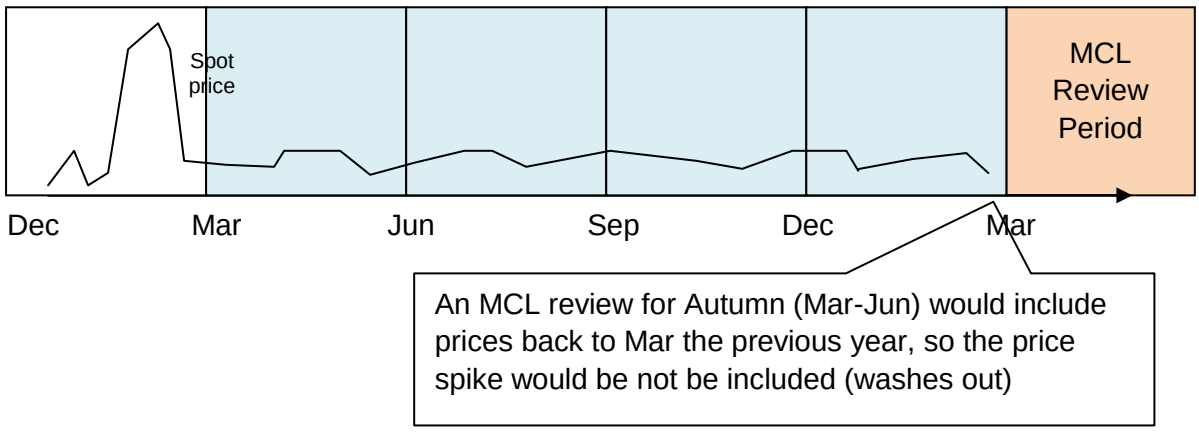


Figure 29: Seasonal quarters for MCL review



Although there is the risk that high prices may occur across the existing MCL review boundary, participants have suggested the current approach reduces the risk.

8.2 Prudential Margin adequacy

The analysis of RAs and FOAs are almost exclusively performed against the prudential margin. This is based on the assumption of reasonable worst case implying the participant is on their trading limit at the time of a failure.

The modelling is consequently relying on the calculation of prudential margin determining a value which is sufficiently high enough to prevent a reasonable worst case event from resulting in a NEM shortfall. As an example, a CPT event during a given week would result in an effective average price over the week of $446. If this is compared against the current level of average price and volatility factor being used in the MCL calculation, there are no regions which could withstand a CPT event without creating a shortfall risk.

This raises the question as to whether the current calculation of prudential margin is resulting in values which are adequate to protect the NEM against shortfall in reasonable worst case scenarios. If it is accepted that the prudential margin is inadequate, then the risk analysis performed by the report does not represent the actual risk to the NEM.

It could be argued that the current prudential regime in the NEM of having an MCL and a prudential margin offers 2 layers to risk management. In addition to the MCL providing surety of settlement payment, it offers an additional buffer to cover high prices, and consequently reduce the likelihood of trading limit breaches which may ultimately result in failure and NEM shortfall.

Consequently, preserving the MCL is crucial under the current framework. Any modelling of FOA or RA should not only consider whether there is any additional risk during the reaction period (covered by the prudential margin), but also whether there is an increased likelihood of trading limit breach due to the MCL being consumed.

The report does not consider whether the amount of MCL relief being given is commensurate with the FOA being lodged, and whether there is a net increment in risk to the NEM.

8.3 Increasing the Prudential Margin

Referenced in Sections: 1.3.3, 4.3.1, 4.6, 6.3.2

The recommendation to mitigate this risk is to increase the Prudential Margin by 1 day. This approach predicated on an assumption that the Prudential Margin is a linear function, i.e. the Prudential Margin required to cover a reasonable worst case for 8 days is 8/7 the existing Prudential Margin. There are several reasons why this simple linear extrapolation may not be valid:

- The Cumulative Price Threshold is based on a 7 day period, so the price behaviour in an 8 day period could be significantly higher than in a 7 day period.
- The additional day will fall across a non-business days a proportion of the time.

8.4 Prudential Margin tied-up

Referenced in Sections: 5.3

The various MCL calculation methodologies proposed in the report include factors in the build up which differ between the billing and outstandings period (the first 35 days, or non-reaction period) and the reaction period (the last 7 days). Changing the weighting between the reaction and non-reaction period changes the prudential margin as a proportion of MCL.

However, the prudential margin and MCL differ in the current prudential framework in that participants are not allowed to trade into their prudential margin, i.e. this buffer below credit support must always be preserved. Increasing the prudential margin component of the MCL therefore increases the amount of preserved buffer and reduces the effective amount of trading room of the participant.

This factor is important to consider when evaluating efficiency of various methodologies. By example, the Stress Test Methodology (Admin MCL) has a large proportion of MCL derived from the reaction period, so under actual operation participants would more be likely to provide additional cash and/or credit support in order to preserve the prudential margin. This would reduce the overall efficiency of this model.

8.5 Futures Volatility

Referenced in Sections: 5.3.3

The report proposes to use spot futures prices as a reference for MCL volatility factor, rather than spot prices or an implied volatility measure. The report also states:

> "There, the historical volatility of the spot futures price is used here for the volatility calculation, which provides sufficient data points so that the volatility figure calculated are statistically robust"

No evidence has been provided as to why volatility of spot futures prices is a better representation of market volatility. Although the volatility of spot futures maybe statistically robust, this is irrelevant if the underlying purpose is not satisfied.

It is not clear how the future volatility of spot prices (which is what is trying to be forecast) is better predicted by the volatility of historical spot futures (suggested by the report) rather than the historical volatility of spot prices (as currently used). If historical data is to be used, it would seem more appropriate to use the same value (i.e. spot prices) rather than a partially dependent value (i.e. spot futures prices).

8.6 Volatility Multiplier

Referenced in Sections: 5.3.3

A volatility multiplier of sqrt(6) has been chosen to translate the 98th percentile weekly price into a 42 day (6 week) value. There does not appear to be any sound statistical basis for this approach.

This is further exemplified in the discussion about using sqrt(5) instead of sqrt(6).

8.7 Volatility of MCL

Referenced in Sections: 1.3.4, 5.3.3, 7.2.3

The comparison of different methodologies for calculating MCL appears to indicate that the preferred method (FUT MCL) is significantly more volatile than the Current MCL or other

methods. During the consultation on Seasonal MCL's, AEMO received feedback from a number of participants that volatility (the amount by which the MCL varies from quarter to quarter) is a significant operational issue. Large changes in MCL require re-negotiation of facilities with the participant's banks, which can be time-consuming. Participants favoured less volatile MCL's even though in some cases they may be less efficient.

The results shown in Figures 7.2.3.m-o also indicate the FUT MCL can also result in large excursions in MCL value, for example 2008Q1 in QLD the FUT MCL is approximately $330M, compared to the Current MCL of approximately $160M and the Admin MCL of approximately $240M

9 Other operational risks

9.1 Benefit of FOA

The benefit of FOA is dependent on the amount of MCL relief that is given, and the degree to which margin payments offset any breaches in trading margin. The table below is intended to qualitatively describe the benefit of FOA's in alleviating prudential stress under situations of high spot prices. The factors affecting the effectiveness of FOA's are:

- Futures Lodgement Price
- The price used as a basis of MCL calculation (equivalent to Average Spot Price x Volatility Factor)

Table 4: Benefit of FOA's with respect to high spot prices under MCL and Futures Price scenarios

		MCL PRICE (AVERAGE SPOT PRICE X VOLATILITY FACTOR)	
		LOW	HIGH
FUTURES LODGEMENT PRICE	LOW	Some MCL Reduction Large Margin Payment Large benefit, but low incremental risk	Large MCL Reduction Large Margin Payments Large benefit, but large incremental risk
	HIGH	No MCL Reduction Small Margin Payment Negligible benefit, but low incremental risk	Some MCL Reduction Small Margin Payment Negligible benefit, but low incremental risk

Qualitatively, there are situations where there is negligible benefit of lodging an FOA, and the benefit may be outweighed by the operational overhead of managing the process. It is expected that in these scenarios participant would choose to either not lodge the FOA, or may lodge the FOA and voluntarily withdraw the FOA after the amount of MCL reduction is identified.

The lodgement and subsequent withdrawal of FOA's creates additional operational impact. It is proposed that this issue be mitigated by providing a facility that allows participants to model the expected MCL relief before lodging an FOA, so that participants can decide if the benefit is sufficient to outweigh the effort.

9.2 Resetting of futures price

Model 2 and the PwC Model provide the ability for the retailer to "reset" the price, and effectively retrieve excess margin payments. The models do not clearly identity how this

would operate in practice. Such a facility should be designed to allow a fully automated process to be performed, without the need for email instructions, and manually operated cash flows.

9.3 Email processes

Referenced in Sections 4.4.1

The report proposes that a confirmation of the status of FOA positions is performed using emails. This manual process would be both labour-intensive, and introduce a risk of human error.

The development of the FOA process should ensure all functions can be performed automatically, with human intervention only on exception.

AEMO does not support the approach mentioned in the report / models.

Appendix B: Report clarifications

1 Daily Prudential Monitoring

Referenced in Sections: 2.2

The report states:

> "If the total outstandings for any participant exceeds the trading limit a call notice will be issued by AEMO"

This statement fails to acknowledge several key features of the AEMO's prudential policy:

- AEMO permits participants to voluntarily resolve any breach of trading limit prior to 10:30am.
- The issue of a Call Notice is discretionary.

2 Default and Suspension

Referenced in Sections: 2.3

The report states:

> " There are some circumstances, such as payment default, under which AEMO can issue a suspension notice and suspend the participant without the prior issuing of a default notice"

This statement is contradictory to the National Electricity Rules, which under clause 3.15.21 requires a Suspension Notice to only be issued where a default event has occurred. Specifically with payment default, AEMO would only be able to issue a Suspension Notice if the participant had not remedied the Default Notice by making payment by 1pm the following day.

3 Interpretation of Figure 3.1.a

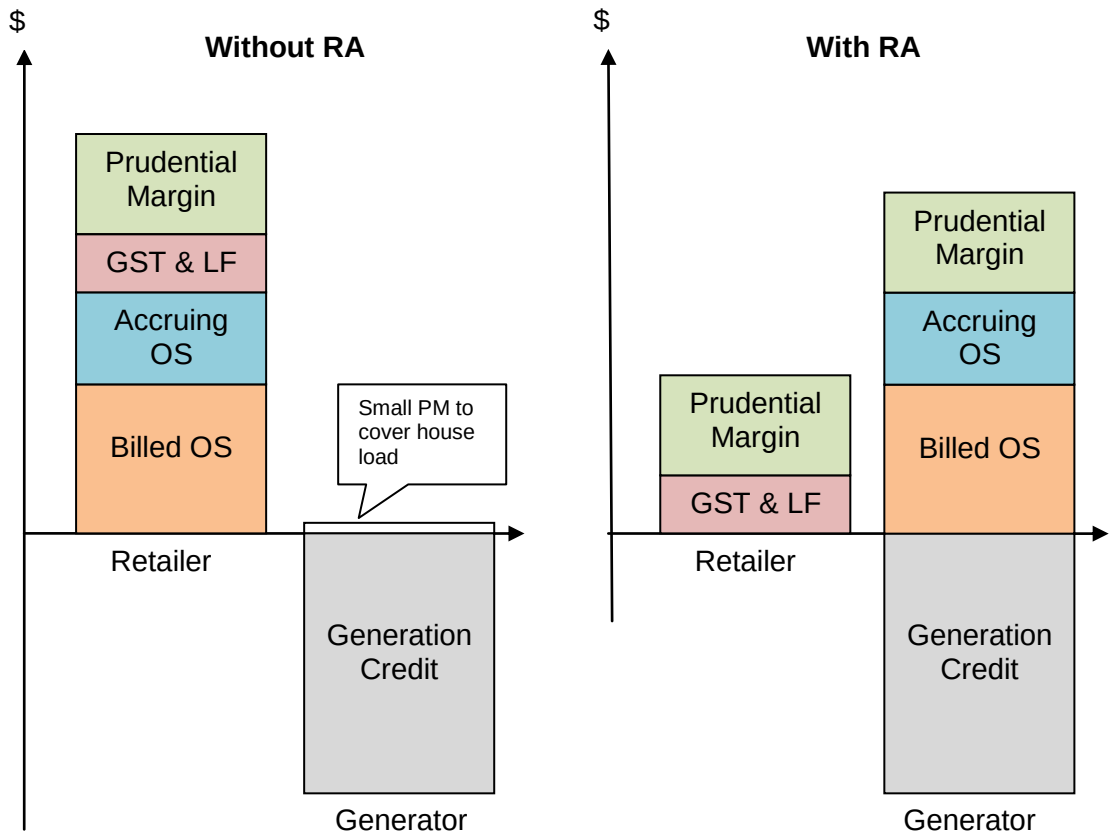
Referenced in Sections: 3.1

Figure 3.1.a provides a comparison of security required with and without RA. In interpreting this graph, several issues have been identified:

- GST and Line Loss Factors are missing from the first bar
- With an RA, there are 2 PM's (one for the retailer and one for the generator). This should be shown as 2 blocks in the second bar.
- It is not obvious that the third and fourth bars are intended to represent an apportionment of the second bar

The diagram below is provided as an alternative representation.

Figure 30: Comparison of security requirement with and without RA



4 Incremental risk of RA

Referenced in Sections: 3.2.1, 3.5

A key factor in the report assessing the risks associated with RA's is the incremental risk to the NEM under different failure scenarios. This is summarised in Figure 3.2.1.a (and repeated in Figure 3.5.a). All scenarios in except one indicate "No Change" to risk (the exception is Two Party Default with an Ex Ante Reallocation, which is discussed in a separate section). In all cases, it is expected that the risk to the NEM would be reduced, and it is important to consider this risk reduction when analysing the overall risks of RA's.

5 Termination of Ex Post RA

Referenced in Sections: 3.2.1

Section 3.2.1 under the heading "Reallocation Agreement Termination as a Result of Retailer Actions" there is discussion of termination of ex-post reallocations. It is important to note that the under the NER a reallocation request can only be terminated prospectively, i.e. for future trading intervals, making it impossible to terminate an ex-post reallocation.

6 Value at Risk

Referenced in Sections: 3.2.1

Figure 3.2.1.b is intended to represent the value at risk for a 1MW load in 1 business day. The 100% value shows the worst 1 days trading in NSW over the observation period, however it is important to consider that the worst case could be significantly higher. A worst case would be a price reaching the CPT within the day, yielding a value at risk in excess of $70k (double the 100% value).

The graph also shows the Median MCL for comparison purposes. Given the scenario of a termination of an RA during extreme prices, it is reasonable to assume that the Retailer will be at or close to their Trading Limit, so a comparison against the MCL is meaningless. It is recommended the comparison be made against the Prudential Margin, as this would be the remaining buffer before exposure to the NEM.

7 Commercial risk of clawback

Referenced in Sections: 3.3.2

The qualitative advice provided in the report regarding clawback risk does not address the relative risks of using SDA's versus credit support.

8 Suspension for no Margin Payment

Referenced in Sections: 4.3.1

The report states:

> "…AEMO may issue a call notice at 1pm and commence suspension proceedings at 11am the next business day…"

The NEM prudential process requires a Default Notice to be issued if the Call Notice has not been responded to, and only if the Default Notice is not remedied by 1pm the following day can a Suspension Notice be issued.

9 Spot market prices over Exposure Period

Referenced in Sections: 4.3.1

Similar to Figure 3.2.1.b, Figure 4.3.1.a is intended to represent the exposure (in $/MWh) to the NEM from a terminated FOA. This graph should also indicate the 100th percentile value, and worst case value.

10 Beta Factor for price deviation

Referenced in Sections: 4.3.2

The report states:

> "…the introduction of a beta factor would be an inefficient way to deal with the risks associated with the deviation between spot and futures market"

The qualitative analysis as to why a beta factor is inefficient does not appear to be a valid conclusion. The data provided in Figure 4.3.2.e indicates that there are times where the accumulation of funds is not sufficient to cover the participant's obligations, but no quantitative analysis has been provided to justify why a Beta Factor is not appropriate.

11 Volatility Factor in Stress Test MCL

Referenced in Sections: 1.3.4, 5.3.4

The Stress Test MCL has been defined as including 4 weeks of futures without volatility, and 1 week of futures with volatility. The rationale for not including the volatility factor for 4 weeks is that the cumulative price threshold week provides sufficient coverage for the outstandings which are monitored as part of the daily prudential monitoring process.

This rationale appears arbitrary, and inconsistent with the current operation of prudential in the NEM, in which MCL values are determined ex-ante and credit support is required to cover the MCL. When performing an MCL review, all 42 days in the credit period are unknown, so some form of Reasonable Worst Case needs to be applied to each day.

12 Improving Effectiveness and Efficiency

Referenced in Sections: 1.3.4, 5.5

The report states:

> "Additional fine tuning of the futures methodology should provide sufficient evidence for futures to be used as a more effective and efficient means to calculate MCL.", and
>
> "…further work to be done to create a formula that increases the efficiency without impairing the effectiveness."

There is a perception that is created that the formulation of MCL can be done in such a way as to simultaneously improve (or not impair) both efficiency and effectiveness. This would seem counter-intuitive, since there is a natural trade-off between efficiency and effectiveness. It is unlikely that "fine tuning" would be able to improve both, without the input of additional information which is better able to predict the future spot price.

A key issue in evaluating each method is weighing up the relative importance of effectiveness and efficiency. The report offers no guidance on this balance, or whether a particular effectiveness is compliant with the definition of Reasonable Worst Case.

Consequently the choice of FUT MCL as the preferred method appears subjective, without a clear definition of an objective function.

13 Prudential Margin 1/6th of MCL

Referenced in Sections: 5.3.1

The report states that the Prudential Margin is equal to 1/6th of the MCL. This is not consistent with either the NER Schedule 3.3, or AEMO's Credit Limits Methodology.

14 Efficiency 2 interpretation

Referenced in Sections: 5.3.7

The calculation referred to “Efficiency 2” is intended to represent the deviation of the total outstandings (TO) from the MCL as a ratio, i.e. (TO – MCL) / TO. In an ideal situation, the MCL would perfectly predict the TO (except for the Prudential Margin).

Consequently the greatest efficiency will occur when the calculated value is low (approximately 16%). However the report states “The greatest efficiency is for values closest to one”. A circumstance of values close to 1 would be where MCL approaches 0, which is neither efficient or effective.

15 Cost/Benefit analysis

Referenced in Sections: 6.3.4

Although the cost/benefit analysis identifies the net MCL relief using various methods, there is no assessment of what the dollar benefit to the industry would be. A key input would be the cost of credit support across different sized participants.

In order to assess the cost/benefit, some estimate of the cost should be made. This would include:

- Cost to AEMO to implement system and process changes
- Cost to participants to implement system and process changes
- Ongoing operational costs (which would depend on the extent the methods were used)

Appendix C: Minor editorial comments

NO	SECTION	COMMENT
1	1.1: Introduction	Last paragraph reads poorly as "locate" is repeated
2	1.3.2: Reallocations	Paragraph 1, last sentence "MLC" -> "MCL"
3	1.3.3: Futures Offset Arrangements	Findings and Conclusions, "We do not believe that the use of FOAs introduces a systemic risk into the AEMC prudential..." should be "NEM prudential..."
4	2.1: Maximum Credit Limit	Paragraph 1, "…lodge credit support up to the level of the MCL…" should be "…lodge credit support at least to the level of the MCL…"
5	2.6: Reallocation Agreements	Paragraph1, "Reallocation Agreements (RA's) where introduced to the NEM in 2007…", should be 2004
6	2.6: Reallocation Agreements	Paragraph 5, "Only ex-ante energy, dollar, and cap reallocations..." should be "Only ex-ante energy, dollar, swap and cap reallocations…"
7	3.2.1: Reallocation Agreement Termination Risk	Summary, Paragraph 2: "AEMO business day" should be "NEM business day"
8	3.2.4: Generator Default for Commercial Purposes	Paragraph 2, sentence 2 "AMEO" -> "AEMO"
9	4.3.1: Termination and Other Operational Risks	No Margin Payment: "AEMO business day" should be "NEM business day" and "AMEO" -> "AEMO"
10	4.3.2: Systemic Risk of Differences between Spot and Futures Prices	Conclusion: Paragraph 2, sentence 4, "…but would be required to may variation…" should be "…but would be required to pay variation…"
11	4.6: Summary of Findings	Load Balancing Risks, PwC Recommendation, "MLC" -> "MCL"
12	5.2 Overview of the current MCL methodology	Paragraph 2, "The Prudential Margin represents the buffer below the MCL…" should be "The Prudential Margin represents the buffer below the amount of undrawn credit support…".
13	5.2: Overview of the current MCL methodology	Figure 5.2.a: Label "MCL" should be "Credit Support"
14	5.3.4: Alternative 2 – Stress Test Methodology (Admin MCL)	Figure 5.3.2.f: Legend "Series2", believed to be "Current MCL"
15	5.3.7: Summary	Sentence 5, "Ass a result…" should be "As a result…"
16	5.3.7: Summary	Efficiency, formula: "Efficiency – " should be "Efficiency = "
17	6.3.3: Maximum Credit Limit Review	Figure 6.3.3.b: Legend "Series2", believed to be "Current MCL"
18	7.2.2: FOA Quantitative Analysis	Figure 7.4.2.a: the last bar in each graph is missing a label, believed to be "100%", and there is no legend for the orange line