RCP PAPER NO.	:	**EMC/RCP/150/2026/CP101**
SUBJECT	:	**REVIEW OF THE NEED FOR ADDITIONAL MITIGATION MECHANISM TO ADDRESS RESIDUAL CREDIT DEFAULT RISKS**
FOR	:	**DECISION**
PREPARED BY	:	**FENG RUILI** **PRINCIPAL ANALYST**
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DATE OF MEETING	:	**15 JANUARY 2026**

Executive Summary

This paper assesses whether the current prudential framework in the Singapore Wholesale Electricity Market (SWEM) is adequate to mitigate residual credit default risk, and if an additional mechanism is necessary.

Our analysis concludes that the implementation of the Performance Bond (PB) Regime[1] in February 2024 provided additional collateral that can be used to offset residual exposure not fully covered by existing credit support. However, we observed that there is still a possibility that a retailer's PB may be insufficient to fully cover its trade exposure[2] shortfalls if the retailer has hedged most of its retail contract quantity. In practice, the potential impact of default and payment shortfall events have been significantly mitigated by EMC's risk management process. We assess that the current prudential framework, bolstered by the PB requirement and robust market safeguards, is adequate with regards to residual default risk.

Therefore, EMC recommends that the RCP **support** the proposal

a) not to introduce any new mechanism to specifically address residual default risk; and

b) to focus on reviewing existing prudential requirements with the intent to update exposure calculation and lower potential market exposure.

At the 150th RCP meeting held on 15 January 2026, the RCP **unanimously supported** EMC's proposal as above.

[1] Refer to Appendix A for more information on the EMA's Performance Bonds Regime. For more information about the EMA's Enhancements to Regulatory Regime for Electricity Retailers, please refer to the EMA's website at https://www.ema.gov.sg/news-events/news/media-releases/2022/enhancements-for-a-more-secure-and-resilient-power-sector

[2] In this paper, "trade exposure" refers to the actual net exposure of a retailer, refer to Appendix B for more information.

1. Introduction

This paper assesses whether the current prudential framework in the Singapore Wholesale Electricity Market (SWEM) is adequate to mitigate residual credit default risk and if an additional mechanism is necessary to specifically address it.

2. Background

Residual default risk refers to the potential shortfall in settlement amounts due to defaults, which cannot be covered by the defaulting Market Participant's (MPs) prudential requirements. In the SWEM, the market rules require all non-defaulting MPs to bear default levies in proportion to their respective absolute net invoice amounts.

At the 137th Rules Change Panel (RCP) meeting, the RCP unanimously supported EMC's recommendation to defer the consideration of Proposal 4 arising from *CP94: Holistic Review of the Current Prudential Requirement Obligations and its Enforcement Process Under the Market Rules*. Proposal 4 sought to address residual default risk by enabling EMC to purchase insurance policies and access the payouts before applying default levies on non-defaulting MPs. This deferral was in view of the Energy Market Authority's (EMA) impending finalization of its Final Determination Paper (FDP) on Enhancements to the Regulatory Regime for Electricity Retailers.

In January 2024, the EMA finalized the FDP and launched Measure 3 (Performance Bonds Regime) of the regime. With clarity on the Performance Bonds Regime, EMC assesses that it is timely to review the relevance of Proposal 4 of CP94, which addresses residual default risk.

This paper assesses whether the current prudential framework in the SWEM is adequate to mitigate residual credit default risk and if an additional mechanism is necessary to specifically address it.

3. Analysis

3.1 How often is default levy imposed in the SWEM?

With liberalization of the retail market and roll-out of the Open Electricity Market (OEM) since 1 November 2018, we saw an increase in the number of new MPs in the SWEM. Consequently, we observed that the occurrence of settlement payment default by MP has become more frequent from 2018 to 2021, as seen in Table 1. Nevertheless, almost all the payment amounts were made good by either drawing from the defaulting MPs' credit support or remedying the default within required time.

Since market start, there has been only one settlement payment shortfall event that led to an imposition of default levy in 2021. The default levy amount was not significant. Its market impact was contained as it did not trigger further default payments from other MPs.

Table 1 summaries the occurrences of payment default and default levy events in the recent years

	Occurrence of Payment Default and Default Levy in the SWEM
From mid-2013 to end 2017	There were 5 notices of default from 2013 to 2017. The settlement amounts were made good by either drawing from the defaulting MPs' credit support or remedying the default by the following day.
2018-2020	There were 43 notices of default from 2018 to 2020. The settlement amounts were made good by either drawing from the defaulting MPs' credit support or remedying the default by the following day.

2021	EMC issued 19 default notices in 2021, and stemming from these, 31 first default levy notices[3] were issued. 17 of these were remedied from MPs existing credit support while 14 first default levy notices were recovered from the market. A default levy of $506,061.55 was imposed upon the non-defaulting MPs in the SWEM
2022	EMC issued four default notices, all of which were remedied on the following business day.
2023	There was no default notice.
2024	There was no default notice.

3.2 What are the safeguards in the SWEM to mitigate the risk of default levy?

The potential impact of numerous default and shortfall events were significantly mitigated by EMC's risk exposure monitoring and margin call process (refer to Table 2) that minimises, close to real time, the risk of payment shortfall.

Table 2 lists the administrative actions (non-exhaustive) that EMC takes when a MP is at risk of or has incurred payment shortfall, before applying default levy

Actions taken by EMC	Description
Risk Exposure Monitoring and Margin Call	On each business day (BD), the EMC assesses the adequacy of credit support held in respect of each MP by calculating their respective Risk Exposure (RE). The EMC notifies an MP when the MP's RE reaches 45% and issues a margin call when the RE reaches or exceeds 55%. The MP must satisfy a margin call within 2 BDs via providing credit support top-up or making pre-payment to the EMC such that the MP's RE is brought below 35%. Otherwise, EMC will issue a notice of default to the MP.
Notice of Default and Request for suspension	EMC issues a notice of default to the MP when the MP fails to a) make payment to the EMC by the MP payment date, or b) top up credit support as required, and kickstart the suspension process if necessary.
Credit Support Draw Down[4]	If a MP fails to satisfy the margin call or make payment on time, EMC can make claim upon the defaulting MP's credit support. All net debtors are required to put up Credit Support to cover at least 38 days of their average daily due with the EMC.
Performance Bond Draw Down	The EMA introduced the Performance Bonds (PB)[5] Regime in February 2024. Should a retailer incur an event of default, and its conventional credit support is insufficient, EMC can immediately

[3] To recover the settlement shortfall resulting from a default in payment, the total amount of first default levy to be collected consists of defaulting MP's unpaid net invoice amount, default interest accrued since MP payment date, costs and expenses incurred by the EMC and less the unclaimed Credit Support of defaulting MP.

[4] EMC may need to 1) prepare Cash Deposit withdrawal notice or 2) prepare Bankers' Guarantee redemption notice. If the MP fails to remedy before 11am the following day, EMC may need to 1) directly draw down credit support from the MP's bank account or 2) directly visit the bank to redeem the Bankers' Guarantee.

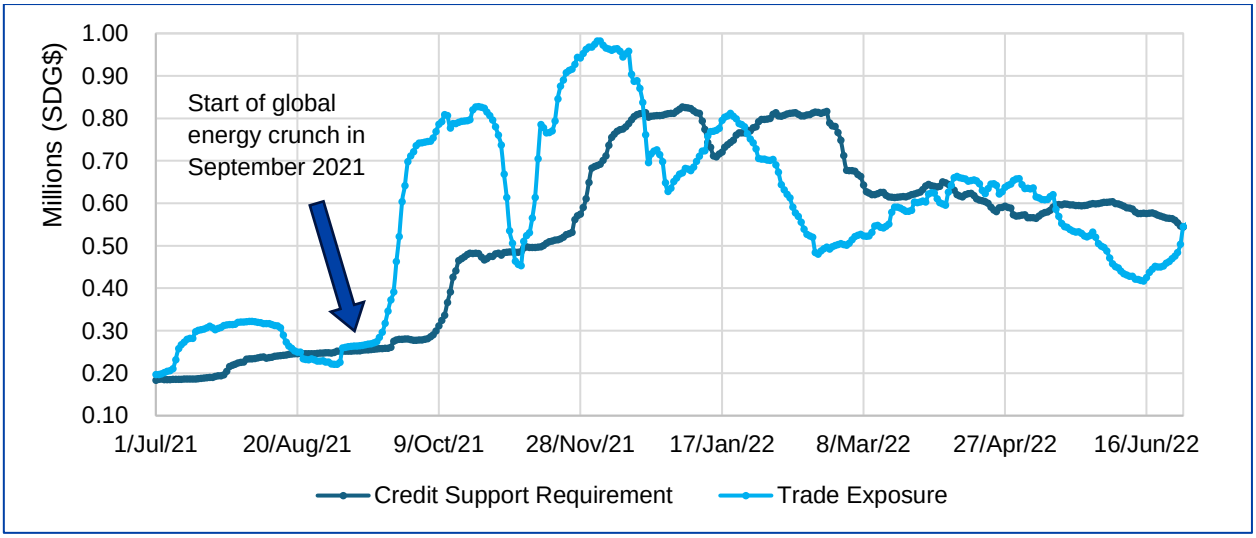
[5] The EMA directed rule change RC385 "Performance Bonds Regime" on 25 January 2024 at https://www.home.emcsg.com/-/media/Market-Administration/Rule-Changes/EMA-Directed-Rule-Changes/2024/385-Performance-Bonds-Regime/RC385_Performance-Bonds-Regime_CombinedFinal.pdf

	exercise its rights to the retailer's PB and additional PB to cover the shortfall owed to the market. Refer to Appendix A for more information about the Performance Bonds Regime.

3.3 Were the prudential requirements (Pre-PB) adequate during the default levy event in 2021?

Figure 1 shows the credit support requirement and trade exposure movements for a typical retailer[6] during the global energy crunch period since September 2021. Refer to Appendix B for the formula of credit support requirement and trade exposure calculations.

Figure 1 Credit support requirement and trade exposure for a typical retailer from 1 July 2021 to 30 June 2022



Key observations of prudential trends:

- **Trends in trade exposure** – During the study period, trade exposures reached their highest levels in Q4 2021, due to the global energy crunch triggering sustained high price period from September 2021.
- **Trends in credit support requirements** – The credit support requirement movements lagged trade exposures. This is because credit support requirement is designed to respond to medium-term trend changes (average over last 90 days). This means that the credit support requirement will be slow to respond to rising prices as it takes time to "catch-up" with the actual trade exposure. This characteristic of the calculation of credit support requirement resulted in significant shortfalls between credit support requirements and trade exposures, especially between September to December 2021.
- **Residual default risks** – As many retailers' credit support requirement levels were significantly below their trade exposures based on actual market conditions in Q4 2021, the risk of a payment shortfall and potential default levy increased significantly. However, trade exposures exceeding the credit support requirement levels do not automatically lead to a payment shortfall or default levy in any given time. The credit support requirement is a theoretical calculation and does not consider EMC's actions (e.g. daily monitoring of MPs' risk exposure and margin calls) or prepayments and credit support provided by MPs above their credit support requirements.
- **Observed behaviour of retailers** – In practice, most retailers provided credit support above their credit support requirements to cover their increasing trade exposures to avoid or respond to margin call. This indicates that retailers were aware of their increasing actual

[6] Assume a retailer with constant customer load requiring the purchase of 1 MWh per trading period in the SWEM.

trade exposures during the high price period and were mitigating their potential default risks by providing more than the 38 days of Average Daily Exposure (ADE)[7] equivalent of credit support amount or making prepayments to lower their trade exposures.

3.4 What are the implications?

Under volatile market conditions, we observed that the credit support requirement levels lagged trade exposures, contributing to the potential insufficiency of credit support during shortfalls and greater residual default risks.

To address this, EMC previously proposed to explore the implementation of tail-end risk insurance to address residual default scenario as part of its holistic review of the current prudential requirement.[8] In time, the EMA also introduced the Performance Bonds Regime in February 2024,[9] which required retailers to provide additional collateral to EMC.

Therefore, this paper assesses whether the current prudential framework, after the implementation of the PB regime, is adequate to mitigate residual default risk or an additional mechanism is necessary to address it.

3.5 The New PB Requirement Strengthened the Prudential Framework

The new PB requirement strengthened the prudential framework through:

1. Priority: Retailer's PBs are held by EMC, which has the first right of recourse to utilize the capital to offset any residual credit defaults not fully covered by existing credit support.
2. Enforcement: The EMA enforces PB regime through regular audits and imposes additional PB requirements if there was significant deviation between a retailer's actualized and forecasted retail contract load.
3. Causer-pay principle: A large unhedged position exposes the retailer to significant default risk if Uniform Singapore Electricity Price (USEP) spikes. The PB regime is designed to cover the exposure of these unhedged quantities. Retailers are required to provide PB for the default risk caused by their unhedged quantities.
4. Adequacy of coverage: For a retailer with unhedged quantity, its PB provision should cover its unhedged quantity for the next 24 months. This enhances the coverage of the retailer's trade exposure and provides additional safety margin. Our study of SWEM data[10] from February 2024 to October 2025 showed that on average, the combined sums of credit support requirements and PB requirements of relevant retailers have more than fully covered their trade exposures. This means that the additional collateral contributed by PB requirement has effectively addressed the shortfalls between credit support requirements and trade exposures. However, we note that the market condition during this study period has been relatively stable. To assess the adequacy of the current prudential framework in mitigating residual default risk under volatile market conditions, we need to "stress-test" it.

[7] Average Daily Exposure (ADE) typically refers to a MP's average daily due over the last 90 calendar days. Refer to Appendix B for more details.

[8] At the 137th RCP meeting, CP94: Holistic Review of the Current Prudential Requirement Obligations and its Enforcement Process Under the Market Rules" was presented.

[9] Refer to Appendix A for more information on the EMA's Performance Bonds Regime. For more information about the EMA's Enhancements to Regulatory Regime for Electricity Retailers, please refer to the EMA's website at https://www.ema.gov.sg/news-events/news/media-releases/2022/enhancements-for-a-more-secure-and-resilient-power-sector

[10] Our study of SWEM data starts from February 2024 because the EMA implemented the Performance Bonds Regime in February 2024.

3.6 Modelling of Adequacy of Current Prudential Requirements (Post-PB) under Volatile Market Conditions

We stress-tested the current prudential framework using historical SWEM market data from 1 September to 31 December 2021, a period with significant volatility. The SWEM saw unprecedented price volatility and uncertainty during this period, amidst the global energy crisis and disrupted natural gas supply from Indonesia.[11] It was also during this same period when the unprecedented default levy was imposed upon the non-defaulting MPs in the SWEM (refer to Section 3.3 for details).

Key Assumptions

We have simulated the credit support and PB required for four retailers, each assumed to have a constant customer load requiring the purchase of 1 MWh per trading period in the SWEM from 1 September 2021 to 31 December 2021, as seen in Table 3. In this hypothetical scenario, we assume no EMC mitigating action, prepayment, nor credit support was provided by retailers that are above their credit support requirements when the retailers have insufficient credit support coverage.

- Scenario 1: Retailer 1's credit support requirements and trade exposures are calculated based on historical USEP. The Temporary Price Cap (TPC)[12] mechanism and PB regime have not been implemented yet. Refer to Appendix C for more details.
- Scenarios 2 to 4: The TPC mechanism and PB regime have been implemented. Retailers 2, 3 and 4 have different PB parameters based on their hedging strategies. For example, retailer 4 is determined to be the most "well-hedged" retailer, so it is required to provide the least amount of PB according to the EMA's PB requirements. Refer to Appendix D for the assumptions used in the simulation of market condition with TPC. Refer to Box 1 and Appendix E for the calculation of estimated PB.

Box 1: Calculation Formula of a Retailer's Required Performance Bond Amount

PB Amount = (Projected Unhedged Quantity) x (Potential Price Difference)

Where:

- Project Unhedged Quantity is the positive difference between the retailer's projected contracted consumer demand and executed acceptable hedges.
- Potential Price Difference is the positive difference between the TPC and the weighted average retail price of the retailer's non-wholesale contracts.

[11] For more information, refer to EMC NEMS Market Report 2021 at https://www.home.emcsg.com/publications/nems-market-reports

[12] The Temporary Price Cap (TPC) mechanism was implemented by the EMA on 1 July 2023. For more information on the Temporary Price Cap mechanism, please refer to the EMA's determination paper at https://www.ema.gov.sg/partnerships/consultations/2023/consultation-on-temporary-price-cap

Table 3 Proportion of time when the retailers' prudential requirements are sufficient to fully cover their trade exposures (1 September 2021 to 31 December 2021)

	Scenarios	PB Parameters			Simulation Results	
		Unhedged Quantity	Retail Price Level[13]	Estimated PB Amount	Full coverage of trade exposure	Insufficient coverage of trade exposure
1	Retailer 1 (Baseline)	No PB			**15%** (18 days out of 122 days)	**85%** (104 days out of 122 days)
2	Retailer 2	20% (80% hedged)	20% lower than TPC	$784,139.14	**100%** (122 days out of 122 days)	0%
3	Retailer 3	20% (80% hedged)	10% lower than TPC	$392,069.57	**100%** (122 days out of 122 days)	0%
4	Retailer 4	10% (90% hedged)	10% lower than TPC	$196,034.78	**66%** (81 days out of 122 days)	**34%** (41 days out of 122 days)

Analysis

Without PB, retailer 1's credit support requirement would be insufficient for 85% of the trading days.

With PB, the residual default risks of retailer 2 and retailer 3 have been eliminated because the combined sums of their credit support and PB requirements would have fully covered their trade exposures for the study period. This shows that the provision of PB is effective in addressing the shortfalls in retailers' credit support requirements under the assumed PB parameters for retailers 2 and 3.

However, even with PB, retailer 4's prudential requirement is insufficient for 34% of the trading days. Retailer 4 is allowed to provide lesser amount of required PB since it has hedged more of its retail contract quantity than the other two retailers, according to the EMA's PB requirement. Unlike PB and credit support, these hedge contracts are not held by EMC and may not be easily accessible to EMC within the required time. Therefore, in the rare and highly unlikely event that retailer 4 defaults, the combined sum of retailer 4's credit support and PB requirements would not be sufficient to fully cover its trade exposure, and residual default risk may still exist.

3.7 Summary

Under volatile market conditions, we observed that the credit support requirement levels lagged trade exposures, raising the potential for insufficient credit support during payment shortfalls and contributing to greater residual default risks. Since then, the EMA introduced the Performance Bonds Regime in February 2024.

To assess the adequacy of the current prudential framework in mitigating residual default risk under volatile market conditions, we stress-tested the current prudential framework. The results showed that the provision of PB provided additional collateral that can be used to offset residual credit defaults not fully covered by existing credit support. However, we note that there is a possibility that a retailer's PB may yet be insufficient to fully cover its shortfalls between credit

[13] For benchmarking purpose, since the implementation of TPC in July 2023, the lowest TPC Energy Price level recorded was $449.13/MWh between 1-15 December 2025 and the highest TPC Energy Price level recorded was $606.18/MWh between 16 to 31 October 2023.

support and trade exposure if it has hedged most of its retail contract quantity. In the rare and highly unlikely scenario that this retailer defaults, the combined sum of the retailer's credit support and PB requirements would not be sufficient to fully cover its trade exposure, and residual default risk may still exist.

In reality, settlement payment shortfall or default levy events have been extremely rare in the SWEM. The potential impact of numerous default and shortfall events were significantly mitigated by EMC's risk exposure monitoring and margin call process that minimise, close to real time, the risk of market settlement payment shortfalls. In practice, most retailers also provided credit support above their 38 days credit support requirements.

4. Consultation

The concept paper was published for consultation on 12 December 2025 and a comment was received from PacificLight Power.

Comments received	EMC's response
PacificLight Power	
We believe that relying on Performance Bond (PB) to eliminate residual risk has its disadvantage. It is primarily dependent on the hedge ratio and price difference between TPC price and retail price. However, a fully hedged retailer with no PB with EMC may still face cash flow issues that prevent it from meeting the daily payment obligation to EMC. This implies that the residual risk is effectively still borne by the market. Therefore, PLP would advocate for the residual risk to be actively managed through tightening of the current credit support framework, as the default levy should only serve as the last resort provision for the purpose of keeping EMC whole.	EMC recognizes that, in the rare scenario where a fully hedged retailer defaults due to cash flow issues, the retailer's total credit support and PB requirements may not be sufficient to cover its trade exposure, leading EMC to impose a default levy on the market. Therefore, EMC would propose enhancing the existing prudential requirement to actively manage operational risks in an upcoming concept paper, similar to PLP's advocacy to tighten the existing credit support framework.
On this note, we would also like to request for an update on *CP94: Holistic review of the Current Prudential Requirement Obligations and its Enforcement Process under the Market Rules*. In particular: 1) Progress of Proposal 1 regarding the implementation to shorten the settlement cycle, and 2) Status of Proposal 2 on the adjustment to the calculation of Average Daily Exposure (ADE).	EMC will provide details to Proposals 1 and 2 in an upcoming concept paper.
We would also request EMC to assess implementing additional credit support on MPs with a history of payment default such as: 1) Applying a multiplier on the existing credit support requirement for MPs with payment default within the past 2 years;	EMC appreciates the suggestion and will consider it together with Proposals 1 and 2 in an upcoming concept paper.

Comments received	EMC's response
2) Requiring a MP who has defaulted in payment to provide additional credit support above the usual requirement; and 3) Applying a stricter risk exposure monitoring and margin call on such MPs. We believe that these proposals align with the causer pay principle, to mitigate the default risk posed to the market without imposing additional cost on the rest of the MPs.	

5. Conclusion and Recommendation

We assess that the current prudential framework, bolstered by the PB requirement and robust market safeguards, is adequate. **There is no compelling case to introduce a new mechanism to specifically address residual default risk.** Any new additional mechanism would likely deliver limited marginal risk mitigation benefit, impose additional cost on MPs and inconsistent with encouraging market competition.

Nevertheless, we note that while the PB regime has significantly strengthened the SWEM's prudential regime, residual default risk still exists, albeit with low probability and severity. Instead of introducing another new prudential requirement, EMC **recommends focusing on enhancing the existing prudential requirements,** such as reducing the settlement cycle and examining Average Daily Exposure calculations (namely Proposals 1 and 2 in *CP94: Holistic Review of the Current Prudential Requirement Obligations and its Enforcement Process Under the Market Rules*), with the intent of lowering potential market exposure to default while balancing costs imposed on MPs.

EMC therefore recommends that the RCP **support** the proposal

a) not to introduce any new mechanism to specifically address residual default risk; and

b) to focus on reviewing existing prudential requirements with the intent to update exposure calculation and lower potential market exposure.

6. Decision at the 150th RCP Meeting

The concept paper was discussed at the 150th RCP meeting. The panel **unanimously supported** the proposal to not to introduce any new mechanism to specifically address residual default risk, and to focus on reviewing existing prudential requirements with the intent to update exposure calculation and lower potential market exposure.

Appendix A Performance Bonds Regime

The Performance Bonds Regime was introduced by the EMA in February 2024 as Measure 3 of the Enhanced Regulatory Regime for Electricity Retailers for Greater Consumer Protection.[14] It is designed to ensure retailers are sufficiently resilient against market volatility by strengthening their hedging practices and financial backing.

Hedging Requirements

The EMA requires all retailers to meet the following two hedging requirements on a monthly basis:

- Mandatory hedging: Retailers must hedge at least 80% of their retail contract position on a monthly average basis (e.g. 80% on average across all half-hour periods for a given month) for each month in the rolling 24-month forward period.[15]
- Performance Bond (PB): Retailers must provide PB to cover their projected residual unhedged quantities for every month in the rolling 24-month forward period.

Calculation of Performance Bond Amount

For each month in the forward period, the PB amount is calculated based on the maximum potential financial exposure of the unhedged quantity:

PB Amount = (Projected Unhedged Quantity) x (Potential Price Difference)

Where:

- Project Unhedged Quantity is the positive difference between the retailer's projected contracted consumer demand and executed acceptable hedges.
- Potential Price Difference is the positive difference between the TPC under the TPC mechanism that has been effected for the SWEM since 1 July 2023, and the weighted average retail price of the retailer's non-wholesale contracts.

Performance Bond as a New Prudential Requirement in the SWEM[16]

To strengthen the prudential framework in the SWEM, the EMA designates EMC to manage and hold all PBs. Should a retailer incur an event of default, and its conventional credit support is insufficient, EMC can immediately exercise its rights to the retailer's PB and additional PB to cover the shortfall owed to the market.

Compliance and Enforcement of Performance Bond

To incentivize accurate projection and risk management, the EMA requires retailers to provide additional PB if the deviation between actual and estimated contracted demand exceeds a certain threshold. Compliance is monitored via monthly declarations to the EMA and regular audits.

[14] For more information about the EMA's Enhancement to the Regulatory Regime for Electricity Retailer, including the Performance Bonds Regime, please refer to the EMA's Final Determination Paper at https://www.ema.gov.sg/partnerships/consultations/2023/enhancements-to-the-regulatory-regime-for-electricity-retailers

[15] The EMA has a list of acceptable hedging instruments such as bilateral hedging contracts entered with suppliers with physical generation assets as well as financial hedge contracts entered into with reputable counterparties approved by the EMA.

[16] The EMA directed rule changes RC385 Performance Bonds Regime. For information, please refer to the rule change publication at https://www.home.emcsg.com/-/media/Market-Administration/Rule-Changes/EMA-Directed-Rule-Changes/2024/385-Performance-Bonds-Regime/RC385_Performance-Bonds-Regime_CombinedFinal.pdf

Appendix B Calculation of credit support requirement and trade exposure

Calculation of Credit Support Requirement

To manage the risk of non-payment by MPs, all net debtors are required to put up Credit Support to cover at least 38 days (33 days for market support services licensee or MSSL) of their trade exposure with the EMC. This 38-day requirement accounts for the 20-day settlement cycle, a 13-day suspension process should an MP default on its payments, and the 5-day Retailer of Last Resort (RoLR) transfer lead time to transfer customers to the MSSL.

The minimum required credit support is computed as follows:

Required Credit Support = Estimated Average Daily Exposure (ADE) x 38 calendar days;

Where ADE = average daily due over the last 90 calendar days

An MP's credit support amount is monitored on an ongoing basis for its adequacy to cover the expected trade exposure of 38 calendar days.

Calculation of trade exposure

An MP's trade exposure on trading day t is estimated to be the sum of its actual daily dues over the last 19 calendar days (at the end of the 20-day settlement cycle) and the next 18 calendar days (upcoming suspension and RoLR process) is computed as follows:

$$\text{Trade exposure (t)} = \sum_{i=t-19}^{t} D_i + \sum_{i=t+1}^{t+18} D_i$$

Where D_i = MP's Daily Due of trading day i

Appendix C Calculation of a retailer's trade exposure and credit support requirement

Step 1: Calculate a retailer's daily due. In principle, besides energy costs, a retailer's actual daily due should include other costs like ancillary costs, GST and market fees. However, to simplify the simulation, we assume the retailer's daily due consists of solely the energy costs in this scenario analysis. The periodic energy cost of a retailer is the periodic USEP ($/MWh) multiply by the retailer's periodic Withdrawal Energy Quantity (MWh). The daily due of a retailer is the sum of the periodic energy cost for all 48 periods in a day.

Step 2: Calculate the Trade Exposure based on the calculation formula in Appendix B. For example,

- The trade exposure on 15 April 2021 is the sum of retailer's daily due from 27 March 2021 to 3 May 2021. This is consists of the 20-day settlement cycle (from 27 March 2021 to 15 April 2021) and 18-day suspension and RoLR process (from 16 April 2021 to 3 May 2021).

Step 3: Calculate the Credit Support Requirement based on the calculation formula in Appendix B. For example,

- The Average Daily Exposure on 15 April 2021 is the average daily due from 16 January 2021 to 15 April 2021 (90 calendar days including the actual day).
- The credit support requirement on 15 April 2021 is the retailer's Average Daily Exposure on 15 April 2021 multiply by 38.

Appendix D Example of applying TPC mechanism on historical USEP data

We applied TPC principles on the historical USEP data (1 September 2021 to 31 December 2021) based on assumed TPC parameters in Table D1.

Table D1 Assumed TPC parameters from 1 September 2021 to 31 December 2021

Parameter	Assumptions
Number of Moving Average Periods (Trigger on)	48
Minimum duration of TPC	48
Number of Moving Average Periods (Trigger off)	48
Multiplier for TriggerOn Price	1.5
Multiplier for TriggerOff Price	1.5
Multiplier for TPC Energy Price	1.5
Spot LRMC Multiplier	1.5
Vesting Multiplier	1

With the assumed TPC parameters, Long Run Marginal Cost and Vesting Long Run Marginal Cost provided by the EMA, we estimated the TPC levels from 1 September 2021 to 31 December 2021 and applied to the historical USEP to derive the Trade exposure of retailers for this period.

Following Table D2 shows an example of TPC applied to USEP on 10 October 2021, period 4 onwards. The TPC applied USEP was capped at $609/MWh for the next 48 periods.

Table D2 An example of how TPC was applied on 10 October 2021

Date	Period	Original USEP	TPC applied USEP	TPC Applied?	USEP revised?
9/Oct/21	33	807.11	807.11	No	No
9/Oct/21	34	690.09	690.09	No	No
9/Oct/21	35	690.11	690.11	No	No
9/Oct/21	36	690.11	690.11	No	No
9/Oct/21	37	690.19	690.19	No	No
9/Oct/21	38	807.49	807.49	No	No
9/Oct/21	39	2051.25	2051.25	No	No
9/Oct/21	40	1281.9	1281.9	No	No
9/Oct/21	41	2017.69	2017.69	No	No
9/Oct/21	42	3506.72	3506.72	No	No
9/Oct/21	43	3477.21	3477.21	No	No
9/Oct/21	44	1420.68	1420.68	No	No
9/Oct/21	45	807.83	807.83	No	No
9/Oct/21	46	807.35	807.35	No	No
9/Oct/21	47	3008.85	3008.85	No	No
9/Oct/21	48	3029.88	3029.88	No	No
10/Oct/21	1	3193.68	3193.68	No	No
10/Oct/21	2	2608.25	2608.25	No	No
10/Oct/21	3	1027.52	1027.52	No	No
10/Oct/21	4	1127.75	609	Yes	Yes
10/Oct/21	5	1005.73	609	Yes	Yes
10/Oct/21	6	806.1	609	Yes	Yes
10/Oct/21	7	686.35	609	Yes	Yes
10/Oct/21	8	323.83	323.83	Yes	No
10/Oct/21	9	216.31	216.31	Yes	No
10/Oct/21	10	1107.17	609	Yes	Yes
10/Oct/21	11	1127.94	609	Yes	Yes
10/Oct/21	12	1128.05	609	Yes	Yes
10/Oct/21	13	216.36	216.36	Yes	No
10/Oct/21	14	212.11	212.11	Yes	No
10/Oct/21	15	201.87	201.87	Yes	No
10/Oct/21	16	323.79	323.79	Yes	No
10/Oct/21	17	1074.08	609	Yes	Yes
10/Oct/21	18	2088.88	609	Yes	Yes
10/Oct/21	19	2524.63	609	Yes	Yes
10/Oct/21	20	2019.44	609	Yes	Yes
10/Oct/21	21	2019.83	609	Yes	Yes
10/Oct/21	22	1010.03	609	Yes	Yes
10/Oct/21	23	202.2	202.2	Yes	No
10/Oct/21	24	201.96	201.96	Yes	No
10/Oct/21	25	263.28	263.28	Yes	No
10/Oct/21	26	263.27	263.27	Yes	No
10/Oct/21	27	1170.18	609	Yes	Yes
10/Oct/21	28	1009.94	609	Yes	Yes

10/Oct/21	29	202.05	202.05	Yes	No
10/Oct/21	30	184.71	184.71	Yes	No
10/Oct/21	31	152	152	Yes	No
10/Oct/21	32	152.04	152.04	Yes	No
10/Oct/21	33	146.86	146.86	Yes	No
10/Oct/21	34	146.86	146.86	Yes	No
10/Oct/21	35	146.7	146.7	Yes	No
10/Oct/21	36	140.63	140.63	Yes	No
10/Oct/21	37	146.71	146.71	Yes	No
10/Oct/21	38	169.01	169.01	Yes	No
10/Oct/21	39	291.96	291.96	Yes	No
10/Oct/21	40	323.96	323.96	Yes	No
10/Oct/21	41	562.38	562.38	Yes	No
10/Oct/21	42	687.2	609	Yes	Yes
10/Oct/21	43	495.16	495.16	Yes	No
10/Oct/21	44	323.49	323.49	Yes	No
10/Oct/21	45	191.61	191.61	Yes	No
10/Oct/21	46	254.89	254.89	Yes	No
10/Oct/21	47	323.51	323.51	Yes	No
10/Oct/21	48	155.8	155.8	Yes	No
11/Oct/21	1	127.89	127.89	Yes	No
11/Oct/21	2	141.48	141.48	Yes	No
11/Oct/21	3	323.28	323.28	Yes	No
11/Oct/21	4	238.5	238.5	No	No

Appendix E Assumptions and simplified calculation of a retailer's amount of performance bond required

To simplify the PB calculation for the scenario analysis, we assumed a constant TPC Energy Price of $559.46/MWh[17] from 1 September 2021 to 31 December 2021. The estimated amount of PB required for the retailers are calculated for the study period based on the calculation formula in Table E1.

Table E1 Calculation for estimated PB amounts for retailers 2, 3 and 4

	Scenarios	PB Parameters		
		Unhedged Quantity	Retail Price Level	Estimated PB Amount
1	Retailer 1 (Baseline)	No PB		
2	Retailer 2	20% (80% hedged)	20% lower than TPC	$784,139.14 = $559.46/MWh x **0.2**[18] x 48[19] x 365[20] x 2[21] x **0.2**[22] x 1 MWh[23]
3	Retailer 3	20% (80% hedged)	10% lower than TPC	$393,069.57 = $559.46/MWh x **0.1**[18] x 48[19] x 365[20] x 2[21] x **0.2**[22] x 1 MWh[23]
4	Retailer 4	10% (90% hedged)	10% lower than TPC	$196,034.78 = $559.46/MWh x **0.1**[18] x 48[19] x 365[20] x 2[21] x **0.1**[22] x 1 MWh[23]

[17] Estimated average TPC level from 1 September 2021 to 31 December 2021

[18] Proportion of price difference between retail price and TPC level

[19] 48 periods in a day in the SWEM

[20] 365 days in a year

[21] 2 years or 24 months forward period

[22] Proportion of unhedged projected customer load

[23] Assume a retailer with constant customer load of 1 MWh per period