RCP PAPER NO.	:	**EMC/RCP/XXX/2025/377**
SUBJECT	:	**REGULATION COST ALLOCATION TO GENERATION SETTLEMENT FACILITIES ABOVE 10MW**
FOR	:	**CONSULTATION**
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DATE OF MEETING	:	**TBC**

Executive Summary

In the Singapore Wholesale Electricity Market (SWEM), regulation costs are allocated based on the causer-pays principle, capping each generation settlement facility's (GSF) share to the first 5MWh per trading period.

The recent influx of larger GSFs, driven by increased solar deployment, necessitates a review of regulation cost allocation. EMC proposes removing the 5MWh cap on AFP for GSFs such that all generation facilities pay a fair share.

EMC would like to seek the views of the industry on the proposed rule modifications. We appreciate receiving comments by **8 August 2025**.

1. Introduction

Regulation costs in the Singapore Wholesale Electricity Market (SWEM) are allocated based on the causer-pays principle. The influx of generation settlement facilities (GSFs) over 10MW, driven largely by increased solar power, necessitates a review of this allocation to ensure these larger GSFs pay their fair share of the system's regulation cost.

This paper seeks to modify the allocation of regulation costs for generation settlement facilities with registered capacities of above 10MW.

2. Background

2.1 Reserve and regulation cost allocation methodology in SWEM

In the SWEM, reserves and regulation are ancillary services procured in the real-time markets. Reserves are provided by generation facilities (or Interruptible Loads) on standby to generate (or be interrupted) to arrest a fall in system frequency during generation contingencies. Regulation corrects second-to-second imbalances caused by small variations in generation and consumption.

It is considered that forced outages of small generators (with registered capacity of less than 10MW) would not result in the activation of reserves, and regulation is sufficient to cover the resulting energy loss from said outages. Therefore, reserve costs are only allocated to generators that are *scheduled* above 10MW per trading period. Regulation costs are currently charged to the first 10MW (or 5MWh in a trading period) of generation for each generator and all loads instead.

2.2 Reserve and regulation cost allocation across different facility registration schemes

The reserve and regulation cost allocation methodology above represents an overarching principle that applies generally. However, there are differences across various registration schemes in SWEM, especially for intermittent generation facilities (IGFs), i.e. solar facilities.

Currently, all IGFs are registered as non-dispatchable facilities in the SWEM regardless of their installed capacities[1] under the following schemes:

a. Individual generation settlement facility (GSF)

   IGFs (and non IGFs with capacity below 10MW) can choose to register as a GSF individually. For such GSFs, regulation costs are allocated to their first 5MWh of metered generation in each trading period.

b. Pseudo GSF

   Multiple IGFs with individual capacities of less 10MW each may be aggregated and registered as one single Pseudo GSF. For Pseudo GSFs, the entire metered generation will be allocated of regulation cost.

c. Non-exporting Embedded Intermittent Generation Facility (NEIGF)

   For embedded IGFs of less than 10MW that do not export to the grid, they can choose to be registered as NEIGFs. A NEIGF pays for its regulation cost based on its estimated generation half-yearly.

It is noteworthy that IGFs with individual installed capacities greater than 10MW are still required to be registered as individual GSFs, instead of as generation registered facilities (GRFs)[2]. This is because the output of IGFs is not controllable and hence is unable to be subject to being

[1] For the avoidance of doubt, all references to name-plate ratings in this paper for IGFs are in MWac.

[2] For non-intermittent generation facilities with name-plate ratings of 10MW or more, they are required to be registered as generation registered facilities (GRFs) and be subject to dispatch.

scheduled and dispatched. Reserve costs are only allocated to generators scheduled above 10MW per trading period, thus IGF GSFs do not incur reserve costs. Regulation costs for each GSF are capped at the first 5MWh, regardless of the generator's installed capacity.

3. Analysis

3.1 Regulation cost allocation to GSFs >10MW

Recently, GSFs with larger installed capacities have entered the market. As of July 2025, there are nine standalone GSFs with installed capacity above 10MW registered in the SWEM.

Currently, such GSFs only pay regulation costs up to the first 5MWh of their metered generation in each trading period. They are not allocated reserve cost. For example, a 40MW GSF and four 10MW GSFs incur different regulation costs. Assuming these GSFs are IGFs whose generation follows the latest solar generation profile by EMA, Table 1 shows the annual regulation cost differences, highlighting how the larger 40MW GSF is under-allocated regulation costs.

Table 1: Differences in Annual Regulation Costs

	A 40MWac IGF GSF	Four 10MWac IGF GSF
Daily IEQ[3]	121.0MWh	121.0MWh
Daily FEQ[4] (quantity that is subject to regulation cost)	90.0MWh	121.0MWh
Estimated annual regulation cost[5]	$14,124	$18,981

Considering that the magnitude of disturbances caused to the system by a 40MW GSF should be similar to that of a group of four GSFs of 10MW each, the current regulation cost allocation appears to unduly favour bigger GSFs.

3.2 Proposed solution

To ensure that GSFs, regardless of their capacities, pay their fair share of regulation costs, the regulation cost allocation methodology should be modified such that the full amount of generation from GSFs is subject to regulation cost, instead of only the first 5MWh.

3.3 Implementation

Implementing this proposal requires changing how EMC's systems allocate regulation costs to all current and future GSFs. This is an extensive change and is expected to incur significant costs and time. While justified and in line with the causer-pays principle, its current impact is limited[6]. Hence, we propose implementing this change alongside another major system update in the future

[3] IEQ is the metered generation quantity of a generation facility in a trading period. In this table it is estimated using the latest solar generation profile (version 1.19) published by EMA.

[4] FEQ is the energy quantity that a generator/load is subject to regulation cost in a trading period. For a GSF, its FEQ takes the minimum of its IEQ and 5MWh in each period.

[5] Estimated using the average AFP ($0.43/MWh) in 2024.

[6] As of July 2025, there are only two GSFs that are projected to be undercollected AFP charges. The projected annual undercollection of AFP charges from these two units currently stands at $5,736.15.

4. Proposed Modifications to the Market Rules

To effect the proposal in section 3.2 of this paper, modifications to Chapter 7, sections 3.2.2.1 and 3.2.2.2 of the market rules are proposed. Please refer to Annex 1 for the proposed modifications.

5. Consultation and Conclusion

The current regulation cost allocation caps the share of a GSF to the first 5MWh of its generation in each trading period. This may result in GSFs with larger installed capacities being under-charged regulation costs. To ensure that all generation facilities pay a fair share of their regulation cost, EMC has proposed to remove the 5MWh cap in allocating regulation cost to GSFs.

EMC would like to seek the views of the industry on the proposal and the proposed rule modifications. We appreciate receiving comments by **8 August 2025**.

ANNEX 1: Proposed Changes to the Market Rules

Existing Market Rules (1 January 2022)	Proposed Rules Changes (Deletions represented by strikethrough text and additions represented by double underlined text)	Reasons for Modification
Chapter 7	**Chapter 7**	
3 NET SETTLEMENT INTERVAL CREDITS	**3 NET SETTLEMENT INTERVAL CREDITS**	
3.2 NET REGULATION SETTLEMENT CREDITS	**3.2 NET REGULATION SETTLEMENT CREDITS**	
3.2.2.1 For a *settlement account* which is not associated with any *pseudo generation settlement facility*: $FEQ_h^a = WEQ_h^a + \sum_{m(a)} \mid MIN [IEQ_h^{m(a)}, CSZ] \mid$ where: a = a *settlement account* which is not associated with any *pseudo generation settlement facility* h = a *settlement interval* $\sum_{m(a)}$ = sum over all *MNN*s m(a) of *GRFs* and *GSFs* associated with *settlement account* a	3.2.2.1 For a *settlement account* which is not associated with any *pseudo generation settlement facility* where *net AFP treatment* has been granted under section 5.5A.4 of Chapter 2 to the *EGF group* to which such *pseudo generation settlement facility* is assigned: $FEQ_h^a = WEQ_h^a + \sum_{m(a)} \mid MIN [IEQ_h^{m(a)}, CSZ] \mid + \sum_{n(a)} \mid IEQ_h^{n(a)} \mid$ where: a = a *settlement account* which is not associated with any *pseudo generation settlement facility* where *net AFP treatment* has been granted under section 5.5A.4 of Chapter 2 to the *EGF group* to which such *pseudo generation settlement facility* is assigned	To stipulate that the FEQ of all generation settlement facilities, including pseudo generation facilities where net AFP treatment has not been granted under section 5.5A.4 of Chapter 2 to the EGF group to which such pseudo generation settlement facility is assigned, shall be the absolute value of the IEQ of the generation settlement facility in a settlement interval.

Existing Market Rules (1 January 2022)	Proposed Rules Changes (Deletions represented by strikethrough text and additions represented by double underlined text)	Reasons for Modification
MIN[X,Y] = Minimum of X or Y |X| = positive value for a real number, disregarding the sign CSZ = the cut-off size (in MWh) described in Appendix 7A	h = a *settlement interval* $\sum_{m(a)}$ = sum over all *MNN*s m(a) of *GRFs* ~~and *GSFs*~~ associated with *settlement account* a $\underline{\sum_{n(a)}}$ = sum over all *MNN*s n(a) of *GSFs*, including *pseudo generation settlement facilities* where *net AFP treatment* is not granted to the *EGF group* to which such *pseudo generation settlement facility* is assigned, associated with *settlement account* a MIN[X,Y] = Minimum of X or Y |X| = positive value for a real number, disregarding the sign CSZ = the cut-off size (in MWh) described in Appendix 7A	
3.2.2.2 For a *settlement account* which is associated with a *pseudo generation settlement facility* and *net AFP treatment* is not granted to the *EGF group* to which such *pseudo generation settlement facility* is assigned: $FEQ_h^a = WEQ_h^a + \sum_{n(a)} \lvert IEQ_h^{n(a)} \rvert$	3.2.2.2 ~~For a *settlement account* which is associated with a *pseudo generation settlement facility* and *net AFP treatment* is not granted to the *EGF group* to which such *pseudo generation settlement facility* is assigned:~~ ~~$FEQ_h^a = WEQ_h^a + \sum_{n(a)} \lvert IEQ_h^{n(a)} \rvert$~~	Consequential change

Existing Market Rules (1 January 2022)	Proposed Rules Changes (Deletions represented by strikethrough text and additions represented by double underlined text)	Reasons for Modification
where: a = a *settlement account* which is associated with a *pseudo generation settlement facility* and *net AFP treatment* is not granted to the *EGF group* to which such *pseudo generation settlement facility* is assigned h = a *settlement interval* $\sum_{n(a)}$ = sum over all *MNN*s n(a) of *pseudo generation settlement facilities* associated with *settlement account* a |X| = positive value for a real number, disregarding the sign	~~where:~~ ~~a = a *settlement account* which is associated with a *pseudo generation settlement facility* and *net AFP treatment* is not granted to the *EGF group* to which such *pseudo generation settlement facility* is assigned~~ ~~h = a *settlement interval*~~ ~~$\sum_{n(a)}$ = sum over all *MNN*s n(a) of *pseudo generation settlement facilities* associated with *settlement account* a~~ ~~|X| = positive value for a real number, disregarding the sign~~ [Deleted and Intentionally Left Blank]	