MINUTES OF THE RULES CHANGE PANEL
139th MEETING
HELD ON WEDNESDAY, 13 MARCH 2024 AT 10.00AM
AT ENERGY MARKET CO. PTE LTD
4 SHENTON WAY #03-01
SGX CENTRE 2, SINGAPORE 068807

Present:	Toh Seong Wah (Chairman)	Henry Gan
	Soh Yap Choon	Koay Yi Jing
	Andrew Tan	Fong Yeng Keong
	Sherman Toh	Wong Yew Chung
Absent with Apologies:	Cheong Zhen Siong	Kevin Fong Chee Wai
	Matthijs Jan Guichelaar	Calvin Quek
	Teo Chin Hau	Dallon Kay
	Dr Toh Mun Heng	
In Attendance: (EMC)	Poa Tiong Siaw	Wang Jing
	Lim Chern Yuen	Vincent Wise
	Li Zhenhui	

	Minutes of 139th RCP Meeting – 13 March 2024	**Action**
1.	**Notice of Meeting** The Chairman called the meeting to order at 10.08am. The Notice and Agenda of the meeting were taken as read.	
2.	**Confirmation of Minutes of the 138th Rules Change Panel Meeting** The Minutes of the 138th Rules Change Panel ("RCP") meeting, held on 16 November 2023, were approved by the RCP.	
3.	**Matters Arising from the 133rd RCP Meeting on 23 March 2023**	
3.1	Mr Lim Chern Yuen recounted that at the 133rd RCP meeting in March 2023, it was proposed, within RC383: Modelling of Energy Storage Systems, to incorporate state-of-charge (SoC) modelling in the amendments to the Market Clearing Engine (MCE) to more accurately model SoC. The RCP then tasked the TWG to examine the feasibility of incorporating SoC and any alternative solutions. Mr Lim reported that EMC has worked with energy storage system (ESS) operators and PSO on solutions to model SoC, and that the TWG has endorsed EMC's proposed mechanism to incorporate SoC in the MCE and the corresponding rule modifications. The details are set out in RC386: Incorporation of State of Charge in MCE Modelling of ESS, to be presented at the 139th RCP meeting.	
4.	**Matters Arising from the 137th RCP Meeting on 21 September 2023**	
4.1	Mr Lim Chern Yuen recounted that at the 137th RCP meeting, EMC presented to the RCP a conceptual proposal to enable more robust	

	calculations for certain values used to determine compliance under the Demand Response (DR) scheme. Namely, on Load Curtailment Quantity (LCQ), Offered Implied Energy Consumption (OIEC), and Scheduled Implied Energy Consumption (SIEC). The RCP then noted that there is a need for further study on the characteristics of non-dispatchable load. While a long-term solution for LCQ calculation should be considered during the review of the Demand Side Management (DSM) sandbox, as a temporary solution, EMC was tasked to explore with the EMA amendments to the current DSM sandbox provisions. Mr Lim shared that with EMA's approval, EMC has made relevant changes to the Implementation Procedures for the DSM sandbox, as a temporary solution while the sandbox is in force.	
4.2	Mr Henry Gan asked how the issues on LCQ will be revisited by EMA at the end of the DSM sandbox. Mr Fong Yeng Keong also queried on any indications on the end date of the DSM sandbox. Mr Lim replied that the DR scheme's features (e.g., payment and penalty amounts, compliance thresholds) remain uncertain post-2024, when the DSM sandbox is currently due to expire, pending EMA's internal discussions. Mr Poa Tiong Siaw clarified that in the meantime, internally, EMC will continue to develop potential solutions.	
4.3	Mr Sherman Toh queried if this proposal is relevant for embedded generators (EG) engaging in DR. Mr Lim replied that EGs and the DR scheme are currently treated separately.	
5.	**Update of Monitoring List, Summary of Outstanding Rules Change Submissions, and RCP Work Plan Status Update**	
5.1	Ms Wang Jing presented the Update of Monitoring List, Rule Change Submission, and RCP Work Plan Status Update.	
6.	**Rules Change Panel Work Plan 2024/2025**	
6.1	Mr Toh Seong Wah provided context on the workplan prioritisation exercise, explaining the standard processes and rationale for conducting the exercise.	
6.2	Mr Vincent Wise presented on progress made in the previous work plan, the list of new issues raised during this year's work plan consultation exercise, proposed a list of 12 issues to be prioritised in this year's work plan, as well as potential issues to be removed or referred.	
6.3	Mr Soh Yap Choon suggested that within the 12 issues to be prioritised, perhaps the two issues related to Temporary Price Cap can be combined into one, and addressed together. Mr Poa Tiong Siaw responded that EMC will take into consideration potential synergies in addressing multiple issues together, when addressing each issue.	

6.4	Mr Henry Gan suggested that among the issues flagged for removal due to ranking in the bottom half for three consecutive years, Issue 21 (Review of handling the metering adjustment payment arising from settlement reruns on a defaulting market participant) and Issue 31 (Redeeming the full amount of an MP's banker's guarantee upon default) should not be removed. He shared the challenges EMC is facing in the daily operation process when handling defaulting MPs and explained rationale for each proposal which will make this process more efficient.	
6.5	Mr Sherman Toh queried whether it is worthwhile combining Issues 21 (as above), 23 (Review of provisions on suspension and termination orders) and 24 (Review of the timeline for suspension hearing) into Issue 1 (Holistic review of the current prudential requirement obligations and its enforcement process under the Market Rules). Mr Poa responded that this has been considered, but combining too many issues into one risks overcomplicating the rule change proposal. Mr Wise further commented that even if Issues 23 and 24 are removed, they may still in practice be assessed when under Issue 1, due to the broad scope of Issue 1 itself.	
6.6	Mr Henry Gan also suggested that among the issues flagged for removal, Issue 28 (Removal of second settlement rerun) should not be removed. He explained the existing operational processes, as well as the rationale for the proposal. Mr Poa responded that the settlement timelines (including rerun timelines) will be reviewed under Issue 1, therefore Issue 28 does not have to be kept as a separate issue.	
6.7	Mr Sherman Toh queried whether some issues pertaining to EMC's operation can be assessed by EMC, that are separate from this RCP prioritisation exercise. Mr Poa responded that the RCP workplan is the default mechanism to prioritise EMC's analysis of rule change proposals. However, as and when the need arises, EMC will assist to facilitate necessary rule changes required to address urgent operational needs.	
6.8	Mr Wise presented EMC's recommendations as follows: 1. Agree on the list of 12 issues to be addressed within 12 months in the updated work plan; 2. Remove Issues 9 (Review of definition of forced outage in gate closure exemptions), 23 (as above), 24 (as above), Issue 28 (Removal of Second Settlement Rerun) and 29 (Improvement of real-time information flow regarding unplanned outages and return to service); 3. Refer Issue 36 (Provision of a more accurate demand forecast based on LAR and DAR) to PSO. The RCP **unanimously supported** EMC's recommendations above.	

7.	**RC383: Modelling of Energy Storage Systems and RC386: Incorporation of SoC in MCE modelling of ESS**	
7.1	Mr Lim Chern Yuen recounted that in RC383, the goal is to improve modelling of ESS in the MCE, to ultimately facilitate dispatch schedules that can better reflect ESS's physical capabilities. Mr Lim shared that the current proposed changes to MCE modelling of ESS can be split into four groups, to be tackled in RC383 and RC386: 1. ESS energy storage offers that can include both positive and negative quantities (with associated changes to MCE formulation elsewhere) – discussed in RC383 2. Reserve constraints that apply to ESS – discussed in RC383 3. Regulation constraints that apply to ESS – discussed in RC383 4. SoC-related constraints that are only applicable to ESS – discussed in RC386	
7.2	**Recap on RC383: Modelling of Energy Storage Systems**	
7.2.1	*Energy Offers by ESS* Mr Lim shared that the MCE's assumption that generation registered facilities (GRF) are only able to inject to the grid does not hold for ESS that are able to both inject and withdraw (when they are charging) from the grid. Mr Lim shared that not factoring ESS's charging characteristic into the market clearing process may lead to inaccurate dispatch schedules and consequently, distort the price signal. Therefore, Mr Lim shared EMC's proposal of having a new type of offer – Energy Storage Offers – to allow ESS to submit both positive and negative offer quantities to cater to discharging and charging respectively. Mr Lim then shared the necessary constraints to be introduced to accurately clear such Energy Storage Offers in the MCE. Mr Sherman Toh clarified whether the node generation balance constraint concerns the amount of energy flowing to and from the battery every half hour. Mr Lim and Mr Henry Gan clarified that said constraint is instead an application of Kirchhoff's Law that is applicable to all nodes in the power system.	
7.2.2	*Reserve Provision by ESS* Mr Lim shared that the current modelling of the reserve envelope is not fit for purpose for ESS, (e.g., it requires a facility to be scheduled for some positive energy to allow for any reserve provision). ESS, however, are capable of providing reserves even when energy schedule is zero or negative. It is thus proposed to amend the reserve envelope for ESS to allow for the provision of reserve when energy schedule is zero or negative, based on a set of simplified constraints.	

7.2.3	*Regulation Provision by ESS* Mr Lim shared that the current mixed integer programme-based regulation constraints for typical GRFs are not required for ESS, as an ESS is able to provide regulation throughout its operating range. Therefore, it is proposed to amend/simplify the regulation constraints applicable to ESS, to enable ESS to provide regulation when it is charging and discharging, limited only by its operating range.	
7.2.4	Mr Wong Yew Chung queried if the proposed changes to ESS modelling intend to better reflect an ESS's physical characteristics. Mr Lim responded that the changes have the said intention, and Ms Wang Jing assured Mr Wong that the approach and rules have been consulted with the industry, including ESS operators. Mr Soh Yap Choon sought to confirm if these changes would allow ESS to get cleared for regulation and reserve, even if the ESS does not offer into the energy market, and if these changes would see the discontinuation of the current workaround for ESS participation – the "offset approach". Mr Lim and Ms Wang affirmed his understanding on both counts. Mr Sherman Toh clarified if these changes would require ESS operators to offer into the energy market and get cleared to charge from the grid. Mr Lim and Ms Wang affirmed his understanding.	
7.3	**RC386: Incorporation of SoC in MCE modelling of ESS**	
7.3.1	Mr Lim presented the potential options related to SoC to ultimately facilitate accurate modelling of ESS, namely: Option 1: Status Quo with Enhanced Compliance Checks Option 2: SoC Data Provided by PSO Option 3: SoC Data Provided by ESS Operators Mr Lim shared that at the 32nd TWG meeting in January 2024, the TWG unanimously supported EMC's recommendation to adopt Option 2.	
7.3.2	Mr Lim shared an overview of the SoC modelling mechanism under Option 2, where: 1. EMC receives SoC data 10 minutes before each period, 2. Performs data pre-processing to derive ExpectedStartSoC, and; 3. Includes new SoC related constraints in real-time and forecast schedules.	
7.3.3	*Data Pre-Processing* Mr Lim shared the methodology to estimate ExpectedStartSoC – an estimate of the amount of charge an ESS has at the start of a period, how it will be further capped within an ESS's MinSoC and MaxSoC, and how it will be further converted into energy limits in MWh. Ms Koay Yi Jing noted that the proposed methodology accounts for an ESS's charging and discharging efficiency, and queried how this is derived. Mr Lim responded that this information will be provided by the	

	ESS operator to the PSO for the PSO's review during facility registration. Mr Soh queried if the relevant PSO forms would then require amendments, to which Mr Lim answered in the affirmative. Mr Sherman Toh and Mr Andrew Tan queried that given ESS can de-grade over time, how any changes to the charging or discharging efficiency would be accounted for. Mr Lim responded that ESS operators would need to update such information from time-to-time following established procedures.	
7.3.4	*SoC-related Constraints* Mr Lim shared EMC's proposed SoC related MCE constraints based on different combinations of scenarios below: 1. The ESS charges/discharges for 30 minutes, following its energy schedule; 2. The ESS provides either regulation up or down continuously for 30 minutes, following its regulation schedule; 3. The ESS provides 10 minutes of primary reserve for the first 10 minutes of the dispatch period, following its reserve schedule; and 4. The ESS provides either 30 minutes of contingency reserves throughout the period, or, 20 minutes of contingency reserves after 10 minutes of primary reserve activation. Mr Lim went on to share how the energy limits (in MWh) will be applied, assuming different combinations of scenarios above. He also clarified that EMC has sought to be as conservative as possible, always assuming the most extreme scenarios. Mr Soh clarified if ESS can be scheduled to provide reserve when they are scheduled to charge. Mr Lim confirmed that is the case given the ESS is able to provide reserve by stopping/reducing charging and starting discharging. Mr Lim also shared the approach for estimating SoC in forecast runs.	
7.3.5	Mr Wong queried whether these constraints apply to a single ESS or a portfolio of ESS, and whether combined cycle gas turbines (CCGT) have similar constraints. Mr Lim and Mr Poa Tiong Siaw clarified that these constraints are unit-specific, and that CCGTs' schedules are subject to other constraints as well. Mr Wong sought to clarify the underlying concern behind incorporating SoC in ESS modelling, and whether such concerns apply for gas-fired generators. For example, whether gas availability is being similarly captured for CCGTs. Mr Lim then shared that the market largely operates on a self-commitment principle, where if facilities make offers, it is assumed that they are capable of delivering their offered quantities. However, for ESS, as their SoC can change rapidly within the 65-minute gate closure, such constraints would facilitate more accurate dispatch schedules, whereas gas availability is not expected to change rapidly within a few periods.	

7.3.6	Mr Lim presented the benefits to SoC modelling, namely: 1. Greater assurance that ESS can actually deliver when activated for ancillary services 2. ESS operators will not need to adjust their offers as frequently 3. ESS will likely be scheduled more frequently 4. ESS can offer in higher quantities for energy	
7.3.7	Mr Lim then presented a summary of the proposed rule changes required. Chairman queried that given the RCP tasked the TWG to review the rules, whether any external parties with ESS expertise were consulted. Mr Lim shared that in addition to engaging EMC's MCE experts, a market clearing expert from New Zealand was engaged, where he gave input on how ESS schedules can be constrained in real time, beyond what EMC originally had in mind. EMC also consulted industry, including those who operate ESS.	
7.3.8	Mr Lim presented comments received during consultation from EMC Markets and Operations, and Senoko Energy (Senoko).	
7.3.9	Mr Lim shared that EMC Markets and Operations proposed to include enhancements to the StartGeneration parameter in the MCE alongside the ESS modelling changes, owing to implementation synergies. Mr Lim shared that EMC agrees there are benefits in doing so and seeks the RCP's support for this proposal.	
7.3.10	Mr Lim shared 3 comments from Senoko. The first was on the possibility to reduce the time lag for EMC to receive SoC data, and Mr Lim shared that EMC's recommendation is to follow the existing 10-minutes timeline given significant implementation effort and limited benefit. The second was a clarification on whether, when the ExpectedStartSoC is lower than its indicated MinSoC, there should be rounding up conducted on the ExpectedStartSoC value. Mr Lim clarified that this is an exception handling mechanism, to cover rare and unexpected occasions. The third was on forecast schedules and the incorporation of an ESS's auxiliary load. Due to the difficulty of modelling auxiliary load's impact on SoC, and the limited benefits in doing so, EMC recommends not including this at the moment, and to consider this in the future when there is sufficient data and experience on ESS operations.	
7.4	**Implementation Cost and Timeline**	
7.4.1	Mr Lim shared the implementation cost estimates and the expected timelines for all options. Mr Soh queried if the costs on "Internal EMC Manpower" are costs already incurred and accounted for via EMC fees. Mr Henry Gan clarified that these constitute internal costs, while the other line items are external costs. From an accounting perspective, the manpower costs are capital	

	expenditure costs that are tied to the project, rather than operating expenditure. Mr Soh further queried if it is possible, when a vendor is appointed, to include provisions for the vendor to assist with changes post-implementation, instead of having to restart the process of appointing another vendor. Mr Henry Gan agreed to explore this option with the vendor. He also shared that this would also depend on the nature of the changes. Mr Poa further commented that if additional rule change is required, it would have to come before the RCP again.	
7.4.2	Mr Wong suggested getting feedback from MPs post-implementation on whether the changes are fit for purpose.	
7.5	**Recommendation**	
7.5.1	Mr Lim concluded by reiterating the benefits for incorporating SoC, and how the proposed rule modifications under RC386 had been unanimously endorsed by the TWG at its 33rd meeting in February 2024. Mr Lim presented EMC's recommendations as follows: 1. To support the proposed modifications as set out in Annex 1 of RC383 and Annex 1 of RC386; and 2. To recommend that the EMC Board adopts the proposed rule modifications as set out in Annex 1 of RC383 and Annex 1 of RC386.	
7.5.2	The RCP **unanimously supported** EMC's recommendations above.	

There being no other matters, the meeting ended at 1.15pm.

Toh Seong Wah
Chairman

Minutes taken by:
Ivy Leong