Executive Summary

Gate closure requirements and the associated exemptions in the Singapore Wholesale Electricity Market are set out in Chapter 6 Section 10.4 of the Market Rules. This paper provides clarifications of the term “failure to synchronise” used in gate closure exemptions, specifically, in Chapter 6 Section 10.4.1.1(b) and (c) of the Market Rules.

In accordance with the System Operation Manual, a generation registered facility or an import registered facility is deemed to have failed to synchronise if the facility is not synchronised within the approved or instructed dispatch period. A non-compliance notice will be issued by the Power System Operator to the relevant facility for its failure to synchronise.

In the event that a facility cancels its synchronisation due to unanticipated technical faults, EMC assessed that it shall not be deemed as a “failure to synchronise” for the purposes of applying gate closure exemptions. Nevertheless, if the facility can demonstrate to the Market Surveillance and Compliance Panel’s (MSCP) satisfaction that the incident of unanticipated technical faults constitutes a “forced outage”, gate closure exemptions for “forced outage” shall be granted for the three consecutive dispatch periods immediately following the incident.

A proposal was raised to define the timestamp of a facility’s “failure to synchronise” to be “the timestamp of the determination that the technical faults triggered will lead to the facility’s inability to synchronise”. On this, EMC is of the view that it compromises system security and disincentivises facilities to promptly revise their offers to reflect its actual reduced capability, which is a key market design principle.

EMC hence does not support the proposed definition of “failure to synchronise”, and provided clarifications that a cancelled synchronisation shall not be deemed a “failure to synchronise” for the purposes of applying gate closure exemptions.

We would like to seek industry views on the above subject. We appreciate receiving comments by 26 August 2022.
1. Introduction

This paper provides clarifications of the term “failure to synchronise” used in gate closure exemptions and analyses the proposal of defining the timestamp of a facility’s “failure to synchronise”, for the purposes of applying gate closure exemptions, to be “the timestamp of the determination that the technical faults triggered will lead to the facility’s inability to synchronise”.

2. Background

2.1 Gate Closure and Exemptions

Chapter 6 Section 10.4.1 and 10.4.2 of the Market Rules stipulate that no offer or bid variation shall be submitted by market participants (MP) within 65 minutes immediately prior to the dispatch period to which the offer/bid variation applies (“gate closure”), except for certain conditions where exemptions apply. While gate closure provides dispatch certainty and facilitates unit commitment in the Singapore Wholesale Electricity Market (SWEM), gate closure exemptions exist for the primary reason of system security – for a specific facility to better reflect its physical capability, or for all facilities to respond positively to a system stress.

The list of such gate closure exemptions has been reviewed and expanded several times since the start of the market. In assessing new gate closure exemptions, system security considerations always take priority. The current list of gate closure exemptions is:

for offer changes,

a) To reflect a generation registered facility’s (GRF) expected ramp profiles during periods following synchronisation or preceding de-synchronisation;

b) To reflect a GRF’s revised capability for the three consecutive dispatch periods immediately following a forced outage or its failure to synchronise;

c) To reflect an import registered facility’s (IRF) revised capability for the three consecutive dispatch periods immediately following a forced outage, including a forced outage or failure to synchronise any part of the IRF;

d) To decrease energy supply in an energy surplus situation, for which a market advisory notice has been issued;

e) To increase energy, reserve or regulation supply if it improves a shortfall situation, for which a market advisory notice has been issued;

f) To increase energy, reserve or regulation supply if it improves a shortfall situation, for which a high-risk operating state (HROS) or an emergency operating state (EOS) system status advisory notice is in effect; and

g) To reflect a load registered facility’s (LRF) revised reserve capability during a forced outage or following a decrease in energy withdrawal from reserve activation,

for bid changes,

h) To reflect a LRF’s revised capability during a forced outage or following a decrease in energy withdrawal from reserve activation;

i) To increase quantities in energy bids if it improves an energy shortfall situation, for which a market advisory notice has been issued; and

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j) To increase quantities in energy bids if it improves an energy shortfall situation, for which a HROS or an EOS system status advisory notice is in effect, and subject to the price so offered or bidden, other than for additional quantities, being the same as that previously offered or bidden for that period.

All offer and bid changes made after gate closure will be reported by the EMC to the Market Assessment Unit (MAU). MPs that are dispatch coordinators of the relevant GRFs, IRFs or LRFs are then required to submit a report explaining their reasons for the offer and bid changes made after gate closure. Based on the report and additional information (if any), the MAU will provide its analyses and recommendations for all gate closure violations to the Market Surveillance and Compliance Panel (MSCP) for the MSCP’s determination.

### 2.2 Introduction of “Failure to Synchronise” in Gate Closure Exemptions

#### Failure to Synchronise of GRFs

In the recent rules change paper RC357 “Gate Closure Exemptions” which took effect in August 2019, some modifications were made to Chapter 6 Section 10.4.1.1(b) of the Market Rules (or Condition (b) in section 2.1 above) and are summarised in the table below.

<table>
<thead>
<tr>
<th>Table 1: Modifications to Section 10.4.1.1(b)</th>
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<td><strong>Modifications</strong></td>
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<td>(1) expand the gate closure exemptions to allow a GRF to reflect its reduced capability for the three consecutive dispatch periods immediately following its failure to synchronise</td>
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<tr>
<td>(2) refine the gate closure exemption for a GRF that has experienced a forced outage by allowing the GRF to reflect its reduced capability for only the three consecutive dispatch periods immediately following the forced outage</td>
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2 For more details, refer to Section 3.2 in RC357: Gate Closure Exemptions [https://www.emcsg.com/f1841.136648/EMC357-JO-EMA.pdf](https://www.emcsg.com/f1841.136648/EMC357-JO-EMA.pdf)
Failure to Synchronise by IRFs

Similar gate closure exemptions were granted to IRFs in May 2022 following an EMA directive\(^3\). IRFs, in accordance with Chapter 6 Section 10.4.1.1(c) of the Market Rules (or Condition (c) in section 2.1 above), are allowed to make offer variations after gate closure for the three consecutive dispatch periods immediately following a forced outage, including a forced outage or failure to synchronise of any part of the IRF.

2.3 Assessment of “Failure to Synchronise”

As defined in Chapter 8 of the Market Rules, **synchronise** means the process of connecting a generation facility or its generating unit(s) to the transmission system after matching their respective frequencies, voltages and voltage angles. For the approval process for synchronisation, Chapter 5 Section 11.2 of the Market Rules further stipulates that:

1. a GRF shall not synchronise or attempt to synchronise without the PSO’s approval of its request for synchronisation;
2. such request shall be issued by the GRF to the PSO in sufficient time to enable the PSO to approve and the GRF to obtain approval of synchronization in time, no less than 30 minutes in advance of the anticipated time of synchronisation, unless the request is associated with operations relating to the provision of fast start service or regulation;
3. the PSO shall notify the GRF of the approval or rejection of its request for synchronisation as soon as practicable;
4. the GRF shall promptly notify the PSO if it is unable to synchronise in accordance with the approval, and the PSO shall re-assess the approval upon receipt of such notice; and
5. if the PSO rejects the request for synchronisation, the GRF shall not commence to synchronise and submit, subject to gate closure, an offer variation in accordance with Chapter 6 Section 5.1.5 of Market Rules.

In addition, **failure to synchronise** is defined in Chapter 10 Section 10.2.2 of the System Operation Manual (SOM) - a GRF, IRF or commissioning generation facility is deemed unable to synchronise (i.e. non-compliance with PSO’s direction or dispatch instruction) to the PSO controlled grid if it is not synchronised within the approved or instructed dispatch period.

The MSCP, in its investigation of gate closure violations arising from a facility’s failure to synchronise, typically verifies if the PSO has issued a **non-compliance notice**\(^4\) to the relevant facility for its failure to synchronise within the approved dispatch period.

**Example of Gate Closure Exemption Arising from GRF’s Failure to Synchronise**

- GRF has obtained the necessary approval from PSO for its synchronization in Period 1
- GRF has submitted non-zero energy offers for Period 1 and after, reflecting its start-up profile
- GRF failed to synchronise in Period 1 at 00:10
- GRF submitted offer variations to remove its energy offers for Period 3 and onwards in Period 2 at 00:54
- PSO issued a non-compliance notice to the GRF for its failure to synchronise in Period 1

\(^3\) Refer to Rules Modification for EMA’s “Gate Closure Exemption for Electricity Imports”


\(^4\) A sample of the non-compliance notice by the PSO could be found in Appendix 10A (Generation/Import Facility Unable to Sync Notice) of the SOM.
GrF in Period 1 is deemed to have “failed to synchronise” for the purposes of applying gate closure exemptions, it is allowed to change its offers for Period 2, 3 and 4 after gate closure.

GrF’s offer variations for Period 3 and 4 (made in Period 2) after gate closure are therefore exempted; its offer variations for Period 5 and after (made in Period 2) are before gate closure.

**Figure 1: Gate Closure Exemption for Failure to Synchronise**

2.4 **Assessment of “Forced Outage”**

As defined in Chapter 8 of the Market Rules, **forced outage** means an unanticipated intentional or automatic removal from service of equipment or the temporary de-rating of, restriction of use or reduction in performance of equipment.

The MSCP, in its investigation of gate closure violations arising from a facility’s forced outage, typically verifies if the PSO has issued a notice to the relevant facility for its non-compliance with dispatch instructions and/or if the facility could demonstrate to the MSCP’s satisfaction that it has experienced a forced outage.

**Example of Gate Closure Exemption Arising from GrF’s Forced Outage**

- GrF has submitted non-zero energy offers for Period 1 and after, reflecting normal generation profile.
- GrF experienced forced outage at 00:10 in Period 1.
- GrF submitted offer variations to remove its energy offers for Period 3 and onwards in Period 2 at 00:54.
- PSO issued a non-compliance notice to the GrF for its forced outage in Period 1.
- **GrF in Period 1 is deemed to have experienced a “forced outage”** for the purposes of applying gate closure exemptions, it is allowed to change its offers for Period 2, 3 and 4 after gate closure.
- GrF’s offer variations for Period 3 and 4 (made in Period 2) after gate closure are therefore exempted; its offer variations for Period 5 and after (made in Period 2) are before gate closure.
3. Proposal Analysis

The proposer interpreted that “failure to synchronise” is currently based on the timestamp of the technical fault that was triggered which resulted in a facility being unable to synchronise and proposed to define the timestamp of a facility’s “failure to synchronise” as “the timestamp of the determination that the technical faults triggered will lead to the facility’s inability to synchronise” instead.

The proposer also provided the following details of the synchronisation process:

- prior to the synchronisation of any facility, there will be numerous technical faults that will appear in the Distributed Control Information System; in most cases, these faults can be cleared or reset
- in a situation where the time between a facility’s shutting down and synchronisation is short, should there be a fault that cannot be overridden, the station operator will engage the wider operations team (Mechanical, Instrumentation, etc.) for troubleshooting
- the troubleshooting process could be lengthy and has a good chance of exceeding the (proposer’s) current interpretation of “3 periods following the timestamp of the technical fault being triggered”
- changing the definition of the timestamp of a facility’s “failure to synchronise” to “the timestamp of the determination that the technical faults triggered will lead to the facility’s inability to synchronise” would allow the MP sufficient time to analyse and determine if the technical fault will lead to the facility’s inability to synchronise

3.1 “Failure to Synchronise” versus “Cancelled Synchronisation”

Section 2.3 of this paper provided the definition of “synchronise” and “failure to synchronise” in the Market Rules and the SOM respectively.

Prior to the synchronisation of a facility, if the facility experiences unanticipated technical faults that could potentially lead to its inability to synchronise, and subsequently cancels the synchronisation (“cancelled synchronisation”), the facility shall not be deemed to have experienced a “failure to synchronise”, in either the period in which the facility planned to synchronise or the period in which the technical faults were triggered.

Nevertheless, if the facility can demonstrate to the MSCP’s satisfaction that the incident of unanticipated technical faults constitutes a “forced outage”, gate closure exemptions for “forced
"outage" shall be granted for the three consecutive dispatch periods immediately following the incident.

3.2 The Desired Behavior When Possibly Unable to Synchronise

Self-commitment is an important design principle of the SWEM. MPs are responsible for committing their facilities ahead of time, and submitting and revising offers promptly to reflect their facilities’ capabilities as MP themselves have the most current information of their facilities.

As set out in Section 3.2 in RC357: Gate Closure Exemptions, the desired behavior of a facility during a forced outage is to withdraw its offers for many periods after the forced outage, followed by the submission of its reoffer before gate closure for the period in which it is certain of a recovery from the forced outage and ready to resynchronise and generate.

Similarly, for a facility experiencing unanticipated technical faults that could potentially lead to its inability to synchronise, the desired behavior of the facility is to promptly withdraw its offers for the period of synchronisation and many periods after to reflect its inability to synchronise, followed by the submission of its reoffer before gate closure for the period in which it is certain to be able to resynchronise, as illustrated in Figure 3 below.

Figure 3: Desired Behavior When Possibly Unable to Synchronise

For the avoidance of doubt, in the example in Figure 3 above, the facility shall not be deemed to have experienced “failure to synchronise”, in either Period 3 (the period in which the facility planned to synchronise) or Period 1 (the period in which the technical faults were triggered). Nevertheless, if the facility can demonstrate to the MSCP’s satisfaction that the incident in Period 1 constitutes a “forced outage” of the facility in Period 1, gate closure exemptions for “forced outage” shall be granted for Period 2, 3 and 4. Offer variations for Period 3 and 4 (made in Period 2) after gate closure are therefore exempted.

While we agree with the proposer that MPs would need time to troubleshoot and determine whether a technical fault will lead to the facility’s inability to synchronise, we have analysed the proposal in Section 3.3 of this paper and do not support the proposal of setting the timestamp based on the time required for such determination to be made by MPs. The MSCP, in several of its determinations of MPs’ failure to comply with gate closure rules, also reminded MPs to adequately consider the time sensitivity required under the Market Rules when carrying out the assessment or deciding on its actions upon detecting a technical fault, and to uphold clear and timely internal communications to submit offer variations without delay.

Figure 4 below provides an illustration if the MP delays its offer variation until such a determination can be made. The proposal, in this case, is to deem that the facility “failed to synchronise” in Period 3 (the timestamp of the determination that the technical faults triggered in Period 1 will...
lead to its inability to synchronise) and be exempted from gate closure for its offer variations made for Period 4, 5 and 6.

**Figure 4: Undesired Behavior of Delayed Offer Variation**

### 3.3 Analysis of the Proposal and Undesirable Behavior

#### Compromised System Security

In assessing gate closure exemptions, system security considerations should always take priority. As explained by the proposer, the troubleshooting process could be lengthy before a determination could be made. The Market Clearing Engine (MCE) is unable to consider the facility’s unavailability when determining the dispatch and price schedules in the next periods until unattainable offers are withdrawn by the MP, rendering those dispatch schedules sub-optimal or even unusable such that the PSO has to significantly re-dispatch generators in real-time. A much-delayed offer variation could result in prolonged distorted market outcomes that do not reflect the true capacity available in the market, and give both the power system and the market a false sense of security in forecast schedules.

The proposal is incompatible with the market design principle for facilities to promptly revise their offers to reflect its reduced capability. System security could be compromised by undue delay of offer variation following a technical fault that could potentially lead to the facility being unable to synchronise.

#### Incentive Incompatibility

As discussed in the concept paper *CP80 “Invalidation of Offers Following Forced Outage”*, there exists potential financial incentive for an MP not to revise its offers promptly if it is unable to cover its contract positions (i.e. taking a net short position in the spot market) and hence must buy from the spot market at the prevailing pool price.

The proposal does not incentivise the desired behavior of promptly revising offers to reflect a MP’s reduced capability if it is to the MP’s interest to delay offer variation to keep the pool price and therefore its procurement cost low. Granting gate closure exemptions to the 3 periods after the MP makes its determination on its inability to synchronise can incentivise MPs to delay such determinations and deter timely submission of offer variations.

#### Extenuating Circumstances

We recognise that every case of forced outage or failure to synchronise is event- and equipment-dependent. There may be cases where a longer troubleshooting and determination process are required. There could also be extenuating circumstances that warrant special considerations. Nevertheless, the time required to assess each case will invariably be subjective and subject to the influence of financial incentives. It would be impossible to prescribe a rule that correctly applies all the time.
Owing to system security and incentive compatibility considerations mentioned above, EMC assess that there is no compelling reason for the proposed change in definition of “failure to synchronise”. Any extenuating circumstances experienced by a MP can be referred to the MSCP for its independent consideration.

4. Conclusion

This paper has provided clarifications of the term “failure to synchronise” used in gate closure exemptions in accordance with the SOM. In the event that a facility cancels its synchronisation due to unanticipated technical faults, it shall not be deemed a “failure to synchronise” for the purposes of applying gate closure exemptions. Nevertheless, if the facility can demonstrate to the MSCP’s satisfaction that the incident of unanticipated technical faults constitutes a “forced outage”, gate closure exemptions for “forced outage” shall be granted for the three consecutive dispatch periods immediately following the incident.

The paper also reviewed the proposal of defining the timestamp of a facility’s “failure to synchronise”, for the purposes of applying gate closure exemptions, to be “the timestamp of the determination that the technical faults triggered will lead to the facility’s inability to synchronise”. EMC assessed that it compromises system security and disincentivises facilities to promptly revise their offers to reflect its actual reduced capability. EMC does not recommend the Market Rules to be modified in accordance with the proposal.

5. Consultation

We would like to seek industry views on the above subject. We appreciate receiving comments by 26 August 2022.