

RCP PAPER NO. : **EMC/RCP/144/2024/CP98**

SUBJECT : **REGISTRATION OF FACILITIES CONNECTING TO THE DISTRIBUTION NETWORK**

FOR : **DISCUSSION**

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DATE OF MEETING : **14 NOVEMBER 2024**

Executive Summary

EMC is required by the Market Rules to seek the PSO's advice on whether a facility poses a threat to the reliability or security of the transmission system before registering a facility.

This concept paper assesses the proposal whether the PSO's advice on facilities connecting to the distribution network is required. The aim is to streamline the registration process for such facilities and reduce administrative burden.

EMC has learnt from the PSO that existing obligations under the Transmission Code are sufficient to ensure that facilities connecting to the distribution network pose no threat to the reliability or security of the transmission system.

Therefore, EMC proposes to amend the market rules such that for any facility connecting to the distribution network, EMC is not required to seek the said PSO advice for the purpose of registering them, regardless of technology type and facility classification.

At the 144th RCP meeting held on 14 November 2024, the RCP unanimously supported EMC's recommendation.

1. Introduction

EMC is required by the Market Rules to seek the PSO's advice on whether a facility poses a threat to the reliability or security of the transmission system before registering a facility.

This concept paper assesses the proposal whether the PSO's advice on facilities connecting to the distribution network is required. The aim is to streamline the registration process for such facilities and reduce administrative burden.

2. Background

2.1 Definitions for transmission and distribution

In Singapore, facilities may be connected to the grid at the following voltage levels:

- (a) Transmission voltage of 400kV, 230kV and 66kV
- (b) Distribution voltage of 22kV, 6.6kV, 400V and 230V¹

The Transmission Code defines the *transmission network* as “part of the *transmission system* operating at 66kV and above” and defines the *distribution network* as “part of the *transmission system* at 22kV and below”.

We will follow the above definitions when referring to facilities connecting to the transmission and distribution networks respectively.

Also, in Chapter 8 of the Market Rules, the *PSO controlled system* is defined as “the system of *registered facilities* comprising *transmission facilities* at voltage levels of 66kV and above, *generation facilities* and *load facilities* connected to the *transmission system*”.

2.2 Current market rule requirement when registering facilities with EMC

Market Rules Chapter 2

5.2.4. The EMC shall register a facility as a *registered facility* if:

...

- 5.2.4.2 the PSO, upon referral of the application for registration by the EMC, advises the EMC that the facility for which registration is sought poses no threat to the *reliability* or *security* of the *PSO controlled system*;

The market rule above states that prior to registering a facility with EMC, EMC is required to seek the PSO's advice on whether the facility poses a threat to the reliability or security of the transmission system.

Similar clauses are contained in Chapter 2, Sections

- 5.2.4.2 – pertaining to Generation Registered Facilities (GRFs), Import Registered Facilities (IRFs) and Load Registered Facilities (LRFs)
- 5.4.3.2 – pertaining to Generation Settlement Facilities (GSFs)
- 5.4B.2.3 – pertaining to Non-exporting Embedded Intermittent Generation Facilities (NEIGFs)
- 5.4C.3.3 – pertaining to Pseudo Generation Settlement Facilities (PGSFs)

¹ Handbook published by SP Group titled “How to Apply for Electricity Connection”, downloaded from <https://www.spgroup.com.sg/resources>, as well as further input from EMC Markets & Operations

The above market rule requirement does not distinguish between facilities connecting to the transmission or distribution networks. All facilities currently require such a statement from the PSO prior to registration with EMC.

2.3 Transmission Code requirements for the Transmission Licensee and the PSO

4.1.2 Upon receipt of the application from the *connection applicant*, the Transmission Licensee

...

- (c) shall perform the necessary analysis and studies of the connection application to determine a connection scheme that does not have any adverse effect on the secure, stable and reliable operation of the *transmission system* and any other *installation*, or *external party* already connected or seeking connection to the *transmission system*;

...

4.1.3 The Transmission Licensee shall forward the proposed connection scheme (where the proposed connection is to the *transmission network*) to the *Power System Operator*. The *Power System Operator*, upon receiving the proposed connection scheme from the Transmission Licensee

...

- (b) shall conduct analysis and studies to determine the impact of the proposed *connection* of the *generation facility* / modification to existing *generation facility* on the *security*, *stability* and *reliability* of the *power system*;

Similar clauses are contained in Section 4.1 (generation connections) and Section 4.2 (consumer connections) of the Transmission Code, where:

- i. For facilities connecting to either the transmission or distribution network, the Transmission Licensee is required to assess whether the connection scheme would have any adverse impact on the operation of the transmission system; and
- ii. For facilities connecting to the transmission network, the PSO is required to assess its impact on the security, stability and reliability of the power system.
 - a. For facilities connecting to the distribution network, there is no Transmission Code obligation for PSO to conduct such an impact assessment.

Transmission Code obligations on the Transmission Licensee (i.e., SP PowerAssets) are in practice carried out by SP PowerGrid (SPPG) as the Transmission Agent Licensee, on behalf of SP PowerAssets.

3. Analysis

3.1 There is a need for an impact assessment

EMC agreed with the PSO and SPPG that while generation facilities connected to the distribution network tend to have lower generation capacity, there is no guarantee that facilities connecting to the distribution network will not have an adverse impact on the transmission system.

In fact, in Australia² and the UK³, where solar penetration rates are higher, and the bulk of solar generation is connected to the distribution network, high and variable solar output has resulted in transmission congestion. As solar deployment in Singapore increases, it is possible for facilities connecting to the distribution network to have an adverse impact on the transmission system.

EMC considers it prudent to require such impact assessments, including for facilities connecting to the distribution network.

3.2 Existing obligations under the Transmission Code are sufficient

EMC has learnt from the PSO that for facilities connecting to the distribution network, the analysis and studies conducted by the Transmission Licensee under the Transmission Code (mentioned in Section 2.3 of this paper) are sufficient to ensure that such facilities pose no threat to the reliability or security of the transmission system. The analysis and studies satisfy the market rule requirement (mentioned in Section 2.2 of this paper).

Therefore, EMC considers that the market rule requirement can be removed for facilities connecting to the distribution network.

3.3 Streamlining the registration process to reduce administrative burden

There has been a recent influx of smaller-scale facilities registering with EMC that are connecting to the distribution network, including solar generation facilities, energy storage systems and load facilities (participating in Demand Response and/or Interruptible Load).

Removing the market rule requirement for facilities connecting to the distribution network would streamline the registration process for such facilities, thereby reducing administrative burden for all parties involved.

3.4 Retaining the market rule requirement for facilities connecting to the transmission network

The PSO will continue to conduct checks in accordance with the Transmission Code for facilities connecting to the transmission network. EMC should continue to seek the PSO's advice for such facilities.

4. Consultation

The concept paper was published for consultation on 15th August 2024. Comments were received from the PSO and EMC Markets and Operations. The comments raised and EMC's responses are provided below.

² <https://www.abc.net.au/news/2021-10-23/solar-farm-overload-heats-up-the-national-grid/100561218>

³ <https://www.nationalgrideso.com/news/what-are-we-doing-manage-congestion-britains-electricity-network>

S/N	Comment Received	EMC Response
<i>Comments from the PSO</i>		
1	<p>Based on the Transmission Code, distribution generation connections are assessed and approved by the Transmission Licensee. For facilities connected to the distribution network, the analysis and studies conducted by the Transmission Licensee are enough to ensure that such facilities pose no threat to the reliability or security of the transmission system.</p>	<p>EMC notes this comment and has amended our recommendation accordingly.</p>
2	<p>In the past, majority of generation facilities were connected at the transmission network and the endorsement is provided by PSO. This shall continue as per current Market Rule and Transmission Code.</p> <p>However, in recent years, there has been a sharp increase in penetration of Distributed Energy Resources (DERs). The majority of these DERs consists of solar PV systems connected at the distribution network and the connections are endorsed by the Transmission Licensee.</p> <p>Considering that under the Transmission Code, the Transmission Licensee and the PSO are already responsible for the secure operation of the distribution and transmission network respectively, the market rule should be reviewed to reduce unnecessary administrative work and streamline the registration process.</p>	<p>These points have been incorporated under Sections 3.3 and 3.4 of this paper.</p>
<i>Comments from EMC Markets and Operations</i>		
3	<p>Given that we are likely to expect an increasing number of such generation facilities connecting to the distribution network, as distributed energy resources become more common in Singapore, it is therefore important for PSO to assess the impact to the power system when such facilities get registered in the market. Moreover, facilities connected to the distribution network are also connected to the transmission network, which warrants advice from PSO to inform EMC if such facilities would threaten the power system reliability and security of the PSO controlled grid.</p>	<p>EMC has learnt from the PSO that existing obligations under the Transmission Code are sufficient to ensure that facilities connecting to the distribution network pose no threat to the reliability or security of the transmission system.</p>
4	<p>Generation facilities may also be connected to the grid at transmission voltage of 400kV.</p>	<p>Section 2.1 of this paper has been amended accordingly.</p>

5. Conclusion and Recommendation

EMC is required by the Market Rules to seek the PSO's advice on whether a facility poses a threat to the reliability or security of the transmission system before registering a facility. EMC has learnt from the PSO that existing obligations under the Transmission Code are sufficient to ensure that facilities connecting to the distribution network pose no threat to the reliability or security of the transmission system.

Therefore, EMC proposes to amend the market rules such that for a facility connecting to the distribution network, EMC is not required to seek the said PSO advice for the purpose of registering them.

For avoidance of doubt, EMC is proposing that registration of all facilities connecting to the distribution network no longer require such advice from the PSO, regardless of technology type (e.g., solar, energy storage systems, load) or facility classification (e.g., Generation Registered Facility, Generation Settlement Facility, Pseudo Generation Settlement Facility, Non-exporting Embedded Intermittent Generation Facility, Load Registered Facility, Import Registered Facility).

6. Decision at the 144th RCP Meeting

The concept paper was discussed at the 144th RCP meeting, where the panel unanimously supported EMC's recommendation.