

Calculation Methodology and Payment Schedule for the Fixed Market-Related Charge

1. Introduction

Under Chapter 2 Sections 5.4B.2.9 and 5.4B.4 of the market rules, the market participant (“MP”) of an existing or potential non-exporting embedded intermittent generation facility (“NEIGF”) is required to pay the applicable **fixed market-related charge** (“FMRC”) in advance. The FMRC is intended to reflect an estimation of the charges that would have been payable if the MP were to register its embedded intermittent generation facility as an embedded Generation Settlement Facility.

This amount shall be calculated in accordance with the methodology approved by the Energy Market Authority (“EMA”), and paid in accordance with the payment schedule approved by the EMA and published by the Energy Market Company (“EMC”).

This paper describes the calculation methodology as well as the payment schedule for the FMRC.

2. Fixed Market-Related Charge Calculation Methodology

Currently, the FMRC that is applicable to each NEIGF only consists of the estimated regulation charge.¹

Therefore, the FMRC (in \$) for each NEIGF *m* for each half-year period *p* shall be calculated in accordance with the following formula:

$$FMRC_p^m = WAFP_p \times ESGQ_p^m$$

Where:

m = a NEIGF

p = a half-year period

WAFP_p = weighted average of allocated regulation price (AFP) (in \$/MWh) for NEIGFs in the half-year period *p*

ESGQ_p^m = estimated solar generation quantity (in MWh) of NEIGF *m* in the half-year period *p*

The following subsections explain how the WAFP and ESGQ are computed.

2.1 Weighted Average of Allocated Regulation Price (WAFP) Computation

2.1.1 Data Range Used in WAFP Computation

The WAFP is computed half-yearly based on historical data of a moving half-year window as stipulated in Table 1 below:

¹ Please note that the FMRC may consist of other charges in the future, as may be approved by the EMA.

Table 1: WAFP Calculation Data Range

Half-yearly Registration Period that WAFP applies for NEIGFs registered in Year x		Data range used in WAFP calculation
1	1 Jan to 30 Jun of year x	AFP for 1 May year x-1 to 31 Oct year x-1
2	1 Jul to 31 Dec of year x	AFP for 1 Nov year x-1 to 30 Apr year x

2.1.2 WAFP Computation Methodology

The WAFP is calculated by taking the average of historical AFP, weighted by the solar generation factor (SGF) provided by the EMA for the corresponding trading interval, in the most recent six-month period in accordance with the data range stipulated in Table 1.

The WAFP (in \$/MWh) for each half-year period p shall be determined in accordance with the following formula:

$$WAFP_p = \frac{\sum_d \sum_h AFP_h^d \times SGF_h}{D \times \sum_h SGF_h} \times 2$$

Where:

h = a half-hour trading interval in the Singapore Wholesale Electricity Market ("SWEM")

p = a half-year period

d = a trading day in the data range used for WAFP calculation of the half-year period p in accordance with Table 1

\sum_d = sum over all trading days d in the data range used for WAFP calculation of the half-year period p in accordance with Table 1

\sum_h = sum over all trading intervals h in a trading day

AFP_h^d = allocated regulation price (AFP) for trading interval h in trading day d

SGF_h = solar generation factor, representing estimated energy output (in MWh) of an intermittent generation facility of 1MWac for trading interval h, as set out in the most recent Estimated Solar Generation Profile published by EMA²

D = number of trading days in the data range used for WAFP calculation of the half-year period p in accordance with Table 1³

The factor of 2 is to reflect that AFP is charged on a gross basis where both the generation and self-consumption of electricity by the NEIGF are subject to regulation payments.

² https://www.ema.gov.sg/Solar_Generation_Profile.aspx

³ For example, when calculating the WAFP for the period of 1 Jan 2018 to 30 Jun 2018, D denotes the number of trading days in the data range used for the calculation, i.e., from 1 May 2017 to 30 Oct 2017, which is 184 days.

2.2 Estimated Solar Generation Quantity (ESGQ) Computation

For each NEIGF, the total amount of solar generation is estimated using the ISC of the NEIGF and the SGF.

The ESGQ (in MWh) for each NEIGF m for each half-year period p shall be determined in accordance with the following formula:

$$ESGQ_p^m = ISC^m \times \sum_h SGF_h \times T_p^m$$

Where:

m = a NEIGF

p = a half-year period

h = a half-hour trading interval in the SWEM

\sum_h = sum over all trading intervals h in a trading day

ISC^m = installed solar capacity (in MWac) of the NEIGF m

SGF_h = solar generation factor, representing estimated energy output (in MWh) of an intermittent generation facility of 1MWac for trading interval h , as set out in the most recent Estimated Solar Generation Profile published by EMA

T_p^m = number of trading days in the half-year period p during which the NEIGF m is subject to FMRC. For a registered NEIGF, it is the number of trading days in the upcoming half-year period; for a new NEIGF where the registration is being sought after, it is the number of trading days that it is expected to be registered in the half-year period.

A worked example of the ESGQ calculation based on an installed solar capacity (ISC) of 1 MWac and 181 trading days in the half-year period (T) could be found in Appendix 1.

3. Payment Schedule for the Fixed Market-Related Charge

EMC will update the WAFP and the Estimated Solar Generation Profile for each half-year period in accordance with Table 2 below:

Table 2: Date that EMC will update WAFP and Estimated Solar Generation Profile

Half-year period	Date that EMC will update WAFP and Estimated Solar Generation Profile
1 Jan to 30 Jun of year x	On or before 20 Nov of year $x-1$
1 Jul to 31 Dec of year x	On or before 20 May of year x

The FMRC, as defined in the market rules, is the amount payable by a MP (i) in respect of each of its NEIGFs or (ii) as a condition of obtaining the registration of a generation facility as a NEIGF, as the case may be.

For the registration of a generation facility as a new NEIGF,

Payment due date for FMRC	Registration period covered
3 business days before the date that the facility intends to be registered	From the date that the facility intends to be registered to the end of the current half-year period

For a registered NEIGF,

Payment due date for FMRC	Registration period covered
3 business days before 31 Dec of current year	Jan to Jun of next year
3 business days before 30 Jun of current year	Jul to Dec of current year

Appendix 1: Illustration of ESGQ Calculation using Estimated Solar Generation Profile

Worked example

Assuming that the Estimated Solar Generation Profile is as follows:

Period (h)	Solar Generation Factor (SGF)	Period (h)	Solar Generation Factor (SGF)
1	0	25	0.312744
2	0	26	0.312057
3	0	27	0.302075
4	0	28	0.290609
5	0	29	0.27371
6	0	30	0.249619
7	0	31	0.221705
8	0	32	0.188338
9	0	33	0.157245
10	0	34	0.125898
11	0	35	0.094378
12	0	36	0.0621
13	0	37	0.033557
14	0.00017	38	0.012075
15	0.007562	39	0.001379
16	0.029769	40	0
17	0.065075	41	0
18	0.107088	42	0
19	0.150198	43	0
20	0.191488	44	0
21	0.22989	45	0
22	0.259963	46	0
23	0.285839	47	0
24	0.302934	48	0
$\sum_h SGF_h$			4.267465

The ESGQ of an NEIGF with installed solar capacity (ISC) of 1 MWac for the half-year period from 1 Jan 2018 to 30 Jun 2018, is calculated as below:

$$\text{ESGQ} = 1 \text{ MWac} \times 4.267465 \times 181 \text{ days} = 772.411 \text{ MWh}$$