

# **EMISSIONS STANDARDS CODE**

**Energy Market Authority of Singapore**

**13 December 2024**

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## 1 GENERAL AND ADMINISTRATIVE PROVISIONS

### 1.1 The Purpose of this Code

- 1.1.1 This *Code* sets the minimum conditions that Generation Licensees must meet in carrying out their obligations to comply with Emissions Standards. The *Code* also describes the rights and obligations of Generation Licensees in respect of emissions monitoring, reporting, validation and hydrogen readiness, together with the requirements for maintaining these standards in its electricity generation activities.

### 1.2 To Whom this Code Applies

- 1.21 This *Code* applies to a Generation Licensee who is subject to this *Code* as a condition of its generation licence.
- 1.22 A Generation Licensee may be exempted from compliance with this *Code*, in whole or in part, subject to such conditions or restrictions as the *Authority* may determine. A Generation Licensee that has been so exempted shall not, subject to such conditions or restrictions, be required to comply with the provisions of this *Code* that are the subject of the exemption unless and until such exemption is withdrawn or modified.

### 1.3 Definitions

- 1.31 In this *Code*, unless the context otherwise requires:

“Act” means the Electricity Act (Cap. 89A);

“Authority” means the Energy Market Authority of Singapore established under the Energy Market Authority of Singapore Act (Cap 92B);

“Appointed day” means the date determined by the *Authority* on which the *Code* shall come into force;

“Carbon dioxide equivalence”, in relation to any greenhouse gas, means the mass of the greenhouse gas multiplied by its global warming potential as set out in the *Carbon Pricing Bill*;

“Code” means this Emissions Standards Code for power generation units;

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"Cogeneration Power Plant" means a generation facility that consists of integrated equipment and systems designed to simultaneously produce electrical power and useful thermal energy (such as steam or hot water) from a single fuel source, where the combined generation process achieves higher overall energy efficiency, and reduced carbon emissions compared to separate facilities for electricity generation and heat production;

"Embedded Generation Unit", owned by industrial facilities, are responsible for supplying steam and/or electricity for their internal use. Additionally, these units are also permitted to export any surplus electricity generated to the grid;

"Emission Factor" means the quantity of greenhouse gas emissions that a Reportable Generation Unit emits per unit of electricity generated during the specified compliance period, as determined by the *Authority* in accordance with applicable Emissions Standards;

"Emission Allowance Limit" means the maximum quantity of greenhouse gas emissions that a Reportable Generation Unit is permitted to emit during the specified compliance period, as determined by the *Authority* in accordance with applicable Emissions Standards;

"Generation Licensee" has the same meaning as in the *Act*;

"Generation Unit" and "Generating Unit" shall have the same meaning as "Generating Unit" defined in the *Act* and may be used interchangeably in this *Code*;

"Generation Capacity" has the same meaning as "generation capacity" in the Market Rules

"Greenhouse gas" and "GHG" has the same meaning as "greenhouse gas" in the *Carbon Pricing Bill*;

"Market Rules" has the same meaning as "market rules" in the *Act*;

"Market Company" has the same meaning as in the *Act*;

"Net electricity output" means the total electrical energy injected into the grid by a generation facility, measured at the point of connection, after deducting the auxiliary power consumption required for operating the generation unit's essential equipment and systems;

"Point of Connection" has the same meaning of "Connection" as in Transmission Code;

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“Plant Load Factor” refers to the percentage of the actual electricity generation compared to the installed capacity over a specified time period;

“Power System Operator” or “PSO” means the *Authority* acting in its capacity as the person responsible for ensuring the security of supply of electricity to consumers and arranging for the secure operation of the transmission system in accordance with the market rules and applicable codes of practice as described in section 3(3)(e) of the *Act*;

“Power system” means a system comprising the transmission and distribution networks, generation facilities, energy storage systems, consumer installations, and external systems connected to the transmission system;

“Relevant legislation” means the Electricity Act (Cap. 89A), the Energy Market Authority of Singapore Act (Cap. 92B), and includes in each case the regulations made thereunder;

“Repowered fossil fuel-fired generation units” means an existing generation facility that undergoes substantial refurbishment or replacement of core power-generating components while utilizing pre-existing infrastructure, where such modifications extend the operational lifespan of the facility to be comparable to that of a newly constructed generation facility.

“tCO<sub>2</sub>e” means metric tonnes of carbon dioxide equivalence;

“Wholesale Electricity Market” has the same meaning as “wholesale electricity market” in the Market Rules.

## 1.4 Interpretation

- 1.4.1 Unless otherwise defined in this *Code* and appearing in italics, words and phrases shall have the meaning ascribed to them in the *Act*, and words and expressions used in this *Code* shall be construed as if the Interpretation Act (Cap.1) applied to them.
- 1.4.2 Headings are for convenience only and shall not affect the interpretation of this *Code*.
- 1.4.3 A reference in this *Code* to any statute, subsidiary legislation, proclamation, ordinance, by-law, resolution, rule, order, supplements, gazette notification or directive includes all statutes, subsidiary legislation, proclamations, ordinances, by-laws or resolutions, rules, orders, supplements, gazette notifications or directives varying, consolidating, re-enacting, extending or replacing it.
- 1.4.4 A reference in this *Code* to a document or provision of a document includes a modification or supplement to, or replacement or novation of, that document or that provision of that document, as well as any exhibit, schedule, appendix or other annexure thereto.
- 1.4.5 A reference in this *Code* to a body, whether statutory or not, which ceases to exist or whose functions are transferred to another body includes a reference to the body which replaces it or which substantially succeeds to its functions, powers or duties.
- 1.4.6 A reference in this *Code* to the word “including” or a grammatical variation thereof means “including but not limited to”.
- 1.4.7 A reference in this *Code* to the words “in writing” or a grammatical variation thereof includes any communications effected by facsimile transmission, e-mail or other means of communication.
- 1.4.8 Unless the context otherwise requires, a reference to an account shall include a reference to any settlement or financial accounting balance established in association with, and to information associated with, the contractual relationship that underlies the account.

## 1.5 Hierarchy of Documents

- 1.5.1 Nothing in this *Code* shall be construed as affecting the obligation of a Generation Licensee to comply with the provisions of relevant legislation or of its electricity licence and, in the event of an inconsistency between the provisions of relevant legislation or of such electricity licence and the provisions of this *Code*, the provisions of relevant legislation or of such electricity licence shall govern to the extent of the inconsistency.
- 1.5.2 The hierarchy of codes of practice is as follows:

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- (a) Transmission Code;
- (b) Regulated Supply Service Code.
- (c) Market Support Services Code;
- (d) Metering Code;
- (e) Emissions Standards Code and;
- (e) Code of Conduct for Retail Electricity Licensees.

1.5.3 Except as may be otherwise provided in a Generation Licensee, in the event of any inconsistency between provisions contained in more than one code of practice, the provision contained in the higher code of practice referred to in section 1.5.2 shall prevail to the extent of the inconsistency.

1.5.4 In the event of a conflict between conditions contained in this *Code* and provisions contained in the Market Rules, the provision contained in the Market Rules shall prevail to the extent of the inconsistency.

### 1.6 Modifications to This Code

1.6.1 In furtherance of the authority contained in section 16(2) of the *Act*, the process by which this *Code* may be modified from time to time by the *Authority* shall be as follows:

- (a) Before making any modification to this *Code*, the *Authority* shall give written notice to all Generation Licensees and other persons likely to be affected by the proposed modification
  - (i) stating that the *Authority* proposes to make a modification in the manner specified in the notice;
  - (ii) stating the reasons why the *Authority* proposes to make the modification, including whether the need for the modification was the subject of a prior representation made by a third party or a Generation Licensee; and
  - (iii) specifying the period from the date of the giving of the notice (not being less than 28 calendar days) within which written representations with respect to the proposed modification may be made.
- (b) If no written representation is received by the *Authority* within the period specified in the notice referred to in section 1.6.1(a) or if all written representations made in response to such notice are subsequently withdrawn, the *Authority* may modify this *Code* as specified in such notice.

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- (c) Where the *Authority* receives any written representation under section 1.6.1(a), the *Authority* shall, except to the extent that such representation is withdrawn, consider such representation and may –
- (i) reject the representation;
  - (ii) modify the proposed modification in accordance with the representation; or
  - (iii) withdraw the proposed modification,
- and the *Authority* shall, where section 1.6.1(c)(i) or 1.6.1(c)(ii) applies but subject to section 1.6.1(d), modify this *Code* accordingly.
- (d) The *Authority* shall, before modifying this *Code*, respond with reasons to all written representations received in respect of the modification that were not subsequently withdrawn, and advise all Generation Licensees of the outcome of the *Authority's* deliberations in respect of the modification.
- (e) A modification to this *Code* shall not come into force until such time as the *Authority* has complied with section 1.6.1(d), where applicable, and 10 business days, or such longer period of time as may be specified by the *Authority*, have elapsed since the date on which the *Authority* published the modification as required by section 16(2) of the *Act*.

1.6.2 Nothing contained in section 1.6.1 shall prohibit any Generation Licensee or any other party from notifying the *Authority* of suggested code changes.

### **1.7 Coming into Force**

1.7.1 This *Code* shall come into force on the appointed day.



## 2 TWO-TIER EMISSIONS STANDARDS FRAMEWORK

### 2.1 Reportable Generation Unit

2.1.1 New or repowered fossil fuel-fired Generation Unit, where its licence application was submitted and/or added to Schedule A on or after 9 January 2023 – the launch date of the industry consultation, shall be a Reportable Generation Unit that will need to comply with the Emissions Standards Framework.

2.1.2 Generation Units that are not Reportable Generation Unit includes –

- (i) Existing fossil fuel-fired Generation Unit that was commissioned prior to 9 January 2023, except where such a Generation Unit has undergone repowering as defined in this *Code*.
- (ii) Existing fossil fuel-fired Generation Unit that was commissioned prior to 9 January 2023, that undergoes refurbishment or life extension works, where such works are limited to the restoration or renovation of existing power generation infrastructure for the purposes of extending operational lifespan, enhancing reliability, or ensuring continued operations, provided that such works do not constitute repowering as defined in this *Code*.
- (iii) Existing fossil fuel-fired Generation Unit that undergoes routine maintenance, incremental efficiency improvements, or standard practice upgrades, provided that such works do not constitute refurbishment, life extension, or repowering as defined in this *Code*.
- (iv) Renewable energy generation facilities, including but not limited to solar photovoltaic (PV) generation facilities.
- (v) Generation Unit that runs exclusively on non-fossil fuels, including but not limited to units operating on 100% biomass.

### 2.2 Scope of Compliance

2.2.1 Tier 1 Reportable Generation Unit: A Reportable Generation Unit owned by a Generation Licensee shall in the first instance comply with the Tier 1 Emissions Standard at the unit level.

2.2.2 Tier 2 Reportable Generation Unit: A Reportable Generation Unit owned by Generation Licensee that is unable to comply with the Tier 1 Emissions Standard shall comply with the Tier 2 Emissions Standard at the unit level.

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- 2.2.3 A Generation Licensee shall ensure that the Reportable Generation Units are in compliance with the Emissions Standards from the Commercial Operation Date (COD) of its Reportable Generating Unit upon successful completion of all necessary commissioning tests, wherein formal enforcement shall commence upon the Code taking effect on the appointed date.

### **3 Hydrogen Readiness**

#### **3.1 Hydrogen Readiness Requirements**

- 3.1.1 A Generation Licensee shall ensure that its Reportable Generation Unit, regardless of whether it is operating under Tier 1 or Tier 2 Emissions Standard, demonstrates technical capability to combust natural gas blended with a minimum hydrogen content of thirty percent (30%) by volume, prior to the COD.
  
- 3.1.2 The *Authority* reserves the right to increase hydrogen-readiness requirements as Reportable Generation Units capable of combusting higher hydrogen blends become commercially feasible.

## **4 TIER 1 EMISSIONS STANDARD**

### **4.1 Compliance to Tier 1 Emissions Standard**

- 4.1.1 A Generation Licensee shall ensure that any Tier 1 Reportable Generation Unit operated by the Licensee shall not exceed the Tier 1 emissions intensity limit of 0.355 metric tonne of carbon dioxide equivalence per megawatt hour (tCO<sub>2e</sub>/MWh) on an annual basis for each calendar year.

### **4.2 Calculation of Emission Factor for Reportable Generation Units Generating Electricity only**

- 4.2.1 The Emission Factor shall be calculated by dividing the total annual greenhouse gas emissions, expressed in tCO<sub>2e</sub>, of the Tier 1 Reportable Generation Unit by its total annual net electricity generation, expressed in megawatt-hours (MWh) for the calendar year

Formula to calculate Emission Factor for Tier 1 Emissions Standard:

$$\text{Emission Factor} = \frac{\text{Total annual GHG emissions for the calendar year (tCO}_2\text{e)}}{\text{Total annual net electricity generation (MWh)}} \quad (1)$$

- 4.2.2 The total annual GHG emissions of each Tier 1 Reportable Generation Unit shall include all GHG such as carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>) and nitrous oxide (N<sub>2</sub>O), emitted from the combustion of fossil fuels used for electricity generation, such as natural gas, diesel, coal, or any other fossil fuel as applicable.
- 4.2.3 The total annual net electricity generation (MWh) is the total electricity generated and injected into the grid after accounting for the auxiliary load consumption of the Reportable Generation Unit.

### **4.3 Calculation of Emission Factor for Cogeneration Power Plants**

- 4.3.1 The Emissions Standards for new and repowered cogeneration power plants shall comply with Tier 1 Emissions Standard and shall be imposed solely on the electricity generation portion, excluding emissions associated with useful heat production.

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Formula to Calculate the Emission Factor for Cogeneration Power Plants:

*Proportion of electricity generation =* (2)

$$\frac{\text{total annual net electricity generation (MWh)}}{\text{total annual net electricity generation (MWh) + total annual heat generation (MWh)}}$$

*Emissions Associated with electricity generation =* (3)

*Proportion of electricity generation ×*

*Total annual GHG emissions for the calendar year (tCO<sub>2</sub>e)*

*Emission Factor =*  $\frac{\text{Emissions associated with electricity generation (tCO}_2\text{e)}}{\text{Total annual net electricity generation (MWh)}}$  (4)

## 5 TIER 2 EMISSIONS STANDARD

### 5.1 Compliance to Tier 2 Emissions Standard

- 5.1.1 A Generation Licensee shall ensure that any Tier 2 Reportable Generation Unit operated by the Licensee shall comply with an annual Emission Allowance Limit (MtCO<sub>2</sub>e) equivalence to the emissions of a Tier 1 Reportable Generation Unit operating at a Plant Load Factor (PLF) of 50% on an annual basis.
- 5.1.2 Tier 2 Reportable Generation Unit is bound by an absolute emissions limit rather than a PLF limit throughout the year.

### 5.2 Calculation of Tier 2 Emission Allowance Limit

- 5.2.1 The Emission Allowance Limit shall be determined based on the Tier 2 Reportable Generation Unit's Generation Capacity and the applicable emissions intensity limit for Tier 1.

Formula to Calculate Emission Allowance Limit:

$$\begin{aligned} \text{Emission Allowance Limit} &= \text{Generation Capacity (MW)} \times && (5) \\ &\text{Tier 1 Emissions Intensity Limit (0.355 tCO}_2\text{e/MWh)} \times \\ &\text{Plant Load Factor (50\%)} \times \text{Number of Hours in a Year (8760 hr)} \end{aligned}$$

- 5.2.2 The total annual GHG emissions of each Tier 2 Reportable Generation Unit shall include all GHG such as carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>) and nitrous oxide (N<sub>2</sub>O), emitted from the combustion of fossil fuels used for electricity generation, such as natural gas, diesel, coal, or any other fossil fuel as applicable.

## 6 Exemptions

### 6.1 Exempted Generation Units

- 6.1.1 The following categories of Generation Units shall be exempted from complying with Emissions Standards and hydrogen readiness requirement–
- (i) Waste-to-energy (WTE) Generation Units shall be exempted, where such units are primarily intended for waste volume reduction for landfill disposal rather than electricity generation;
  - (ii) Standby Generation Units shall be exempted, where such units are installed exclusively for building backup power supply purposes. The *Authority* shall review the exemption status of such units for potential inclusion under the Emissions Standards if they intend to participate in the wholesale electricity market for the provision of reserves and/or energy;
  - (iii) Emergency Generation Units shall be exempted, where such units comprise emergency generators and small diesel units located within power stations and are designated solely for power plant startup during Black Start scenarios.

### 6.2 Exemptions for Embedded Generation Units

- 6.2.1 Embedded Generation Units shall be exempted from the Tier 1 and Tier 2 Emissions Standards but shall remain subject to the hydrogen readiness requirements under section 3 of this *Code* at commissioning or adopt alternative low-carbon fuels, subject to the *Authority's* approval.

### 6.3 Exemptions in System Emergencies

- 6.3.1 A Reportable Generation Unit shall be granted exemption from compliance with the Emissions Standards when operating pursuant to directives issued by the Power System Operator for the purposes of managing gas or power system emergencies, maintaining system security and reliability, inclusive of circumstances wherein the utilization of diesel fuel becomes necessary. The exemptions would apply under the following circumstances –
- (i) Such exemptions shall apply to the incremental electricity generation resulting from dispatch instructions issued by the Power System Operator for Directed Supply Scheme (DSS), Fast Start Services, or other emergency situations as formally instructed by the Power System Operator.
- 6.3.2 The *Authority* reserves the right to temporarily suspend the need to comply with the Emissions Standards where necessary to maintain energy security, such as mandating certain plants to generate beyond what is permitted by the Emissions Standards during crisis events.

## 7 REPORTING REQUIREMENTS

### 7.1 Reporting Obligations

- 7.1.1 A Generation Licensee must submit to the *Authority* an annual emissions report that includes all Reportable Generation Unit owned by the Licensee, using the template provided by the *Authority*.
- 7.1.2 The Generation Licensee must include in the emissions report all pertinent supporting documentation and certificates issued by independent third-party verification bodies where relevant, wherein such documentation shall be clearly labelled and cross-referenced within the main report to substantiate the Reportable Generation Unit's compliance with Emissions Standards and hydrogen readiness requirements.

### 7.2 Reporting Timeline

- 7.2.1 The emissions report must cover a complete calendar year period from January 1 to December 31 or from the date of the COD to December 31, and such report shall be submitted no later than June 30 of the year immediately following the reporting period.
- 7.2.2 For initial reporting requirements, wherein a Reportable Generation Unit commences operations during the calendar year, the Generation Licensee shall submit an emissions report covering the period from the date of operational commencement through December 31 of that calendar year, whereby such initial report shall be submitted no later than June 30 of the year immediately following the reporting period.

### 7.3 Reporting Requirements

- 7.3.1 The Generation Licensee shall, at the time of licence application, declare the Emission Factor for Tier 1 emissions or Emission Allowance Limit for Tier 2 emissions for each registered Reportable Generation Unit; and shall subsequently validate such declared values during the commissioning test procedures.
- 7.3.2 The Generation Licensee shall declare its hydrogen-readiness at the time of licence application, whereby validation of the Reportable Generation Unit's technical capability to blend up to 30% hydrogen by volume during commissioning test shall not be required; provided that the Generation Licensee submit to the *Authority* a performance guarantee from the Original Equipment Manufacturer during the licence application submission and/or addition to Schedule A.



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- 7.3.3 The Generation Licensee shall submit to the *Authority* the annual emissions report for each registered Reportable Generation Unit, accompanied by a verification report prepared by an accredited external auditor confirming the verification of aforementioned emissions report.
- 7.3.4 The Generation Licensee shall submit to the *Authority* documentation and verification of the incremental diesel fuel consumption for its registered Reportable Generation Unit operating pursuant to Power System Operator's requirements for managing gas or power system emergencies; whereupon such submissions shall qualify the Generation Licensee for exemption from the Emissions Standards for such operations.

## 8 NON-COMPLIANCE WITH THE EMISSIONS STANDARDS

### 8.1 Consequences of Non-compliance with the Emissions Standards

- 8.1.1 Generation Licensees whose Reportable Generation Units exceed their respective Tier of Emissions Standards shall be subject to financial penalties, save for circumstances wherein exemptions apply or mitigating factors, including but not limited to energy security requirements and fuel disruptions, are deemed acceptable by the *Authority* upon case-specific evaluation.
- 8.1.2 Notwithstanding the above, for new or repowered Reportable Generation Units that exceed Emissions Standards during the one-time commissioning test, the *Authority* shall consider remedial measures undertaken by the Generation Licensee to rectify emissions performance in its determination of penalties.
- 8.1.3 Financial penalties for non-compliance shall be imposed in accordance with Part 3, section 14 of the *Act*, whereby the *Authority* may require a Generation Licensee in breach of this *Code* to remit a financial penalty not exceeding the higher of ten percent (10%) of the annual turnover of the licensed business segment, as determined from the Generation Licensee's latest audited accounts, or Singapore Dollars One Million (S\$1,000,000).
- 8.1.4 In determining the quantum of financial penalty to be imposed upon a Generation Licensee, the *Authority* shall take into consideration –
- (i) The severity of the violation as measured by the percentage exceedance above the prescribed Emissions Standards;
  - (ii) The occurrence of previous violations of the Emissions Standards; and
  - (iii) Any mitigating factors submitted by the Generation Licensee.