EMISSIONS STANDARDS CODE

FINAL DETERMINATION PAPER

12 October 2026

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1 Executive Summary

1.1 In 2023, EMA consulted industry on the policy design of emissions standards for new and repowered fossil fuel-fired generating units. Subsequently, in 2024, EMA consulted on the draft Emissions Standards Code (Code). Industry feedback generally supported the policy intent, while raising operational concerns such as (i) the ability to meet the emissions intensity limit on an annual basis, (ii) the ability to meet higher hydrogen-readiness requirements in the future, and (iii) the need for further details on the emissions reporting requirements.

1.2 EMA has carefully considered the feedback and will revise the implementation approach for the emissions and hydrogen-readiness requirements to reflect operational requirements while streamlining regulatory and administrative processes for industry.

1.3 EMA will implement the revised emissions and hydrogen-readiness requirements through existing processes, namely the Centralised Process Request for Proposal (CP RFP) and Ancillary Service Contracts (ASC), as set out in this Final Determination Paper.

1.4 EMA will continue to review the emissions and hydrogen-readiness requirements for new and repowered fossil fuel-fired generating units, considering evolving power system needs and industry developments, to support Singapore's energy transition and net zero ambition while upholding the reliability and security of the power system. EMA will consult industry should any future changes to these requirements be considered.

2 Industry Feedback

2.1 To recap, the draft Code proposed that new and repowered fossil fuel-fired generating units be subjected to (i) an annual emissions intensity limit of 0.355 tCO_2e/MWh; and (ii) at least 30% hydrogen-readiness by volume, with the capability to combust higher percentage hydrogen blends when commercially available.[1] This would encourage the deployment of more carbon efficient CCGTs to support grid decarbonisation.

2.2 Industry feedback generally supported the policy of implementing the emissions intensity limit while raising the following operational concerns:

a. Annual Emissions Intensity Limit. Respondents sought clarifications on compliance with the proposed annual emissions intensity limit of 0.355 tCO_2e/MWh over the longer term. In particular, respondents noted that the increasing deployment of low-carbon alternatives, such as electricity imports, could reduce the plant load factor (PLF) of generating units, which may in turn affect a generating unit's ability to meet the annual emissions intensity requirement.

b. Hydrogen-readiness Compliance. Respondents sought clarification on (i) whether newly built generating units would be able to retrofit to meet the increasing hydrogen-readiness requirement that EMA might impose in the future and (ii) how gencos should validate the hydrogen capability of a generating unit.

c. Emissions Reporting. Respondents requested greater clarity on the annual measurement, reporting, and verification process for the Code.

d. Exemptions. Respondents sought clarification on whether the following activities would be exempted from the annual emissions intensity limit: operations during transient operational states, such as startup procedures, shutdown sequences, and fuel changeover tests.

e. Penalties. Respondents requested clarification regarding potential penalties for non-compliance with emissions standards during commissioning.

[1] "Repowered fossil fuel-fired generating unit" means an existing generating unit that has undergone refurbishment or modification, whether through replacement of any core power-generating equipment (including but not limited to power generator, gas turbine, steam turbine, or heat recovery steam generator) or other means, which has resulted in an extension of its operational life comparable to that of a new generating unit.

3 EMA's Determination

3.1 EMA has carefully considered the feedback received from generation companies (gencos) and Original Equipment Manufacturers (OEMs) on the draft Code. In reviewing the implementation approach for the emissions requirements, EMA also took into account the evolving power sector landscape, including gradual decarbonisation of the grid as well as relevant measures and frameworks introduced in recent years, such as the centralised process for the deployment of new generating units.

3.2 Since 2023, EMA has conducted three rounds of Centralised Process Request for Proposal (CP RFP) to coordinate the deployment of new generation capacity, with emissions and hydrogen-readiness requirements incorporated into each round. In parallel, EMA has also complemented the procurement of new generation capacity with dedicated fast-start ancillary services to manage system contingencies. These developments have established clear processes for the deployment of different types of generating units.

3.3 Taken together, industry feedback and the above developments support a more streamlined approach to implementing the emissions requirements. In lieu of a standalone Emissions Standards Code, EMA will leverage existing processes, including the CP RFP, Ancillary Service Contracts (ASC) and other established regulatory and procurement processes where appropriate, to implement the requirements. This approach will streamline processes while continuing to support the deployment of more carbon efficient generating units.

3.4 EMA's responses to industry feedback in Section 2 are as follows:

a. Annual Emissions Intensity Limit, Emissions Reporting and Exemptions. Under the revised approach, the annual compliance requirement will be replaced with a one-time emissions compliance check during commissioning. Further details on the emissions reporting during commissioning are set out in Section 4. With the switch to a one-time compliance check, concerns around exemptions for transient operational states such as startup, shutdown, and fuel changeover will no longer arise.

b. Hydrogen-readiness Compliance. In the draft Code, new and repowered fossil fuel-fired generating units were required to be at least 30% hydrogen-readiness by volume, with the capability to combust higher hydrogen blends when commercially available. This requirement has been retained under the revised approach to facilitate the future use of higher hydrogen blends. EMA may consult the industry on the technical and commercial feasibility before introducing more stringent hydrogen co-firing requirements in future. To substantiate compliance with the 30% hydrogen-readiness requirement, gencos should submit supporting documents or technical assurance letters from OEMs to EMA at the RFP proposal stage. Gencos will not be required to demonstrate hydrogen-readiness operationally during commissioning.

c. Penalties. In the draft Code, non-compliance with the emissions and hydrogen-readiness requirements was subjected to a financial penalty of the higher of (i) 10% of the annual turnover of the licensed business segment, as determined from the Generation Licensee's latest audited accounts, and (ii) S$1,000,000 under the Electricity Act. Under the revised approach, the emissions requirement has been incorporated into the Performance Conditions under the CP RFP and non-compliance will be managed through the associated Performance Bond. Failure to fulfil the emissions-related Performance Conditions under the CP RFP may result in Performance Bond drawdown in accordance with the relevant CP RFP provisions for new capacity procured from 2031 onwards.

3.5 The details of the revised approach are set out in Section 4.

4 Revised Emissions Requirements

Generating units under the CP RFP

4.1 The emissions intensity limit will be revised from an annual compliance requirement to a one-time compliance requirement during commissioning, set at 0.355 tCO_2e/MWh at 75% PLF. The emissions intensity and hydrogen-readiness requirement will remain cardinal requirements under the CP RFP.[2]

4.2 EMA recognises that a genco's emissions intensity may vary depending on how its units are operated. The revised requirement therefore gives gencos greater flexibility to manage their units efficiently and respond to evolving system needs. It also reduces the regulatory and reporting burden on gencos by removing the need for annual compliance checks.

4.3 Generating units registered as a Generation Registered Facility (GRF) with EMC on or after 1 January 2027 will be required to conduct emissions testing during commissioning. Gencos shall submit emissions testing reports to EMA demonstrating compliance with the emissions requirement no later than the GRF registration date with EMC.[3] This will be measured during commissioning through an emissions test conducted over a continuous period of at least one hour at a constant 75% PLF, based on net electricity output.[4]

4.4 For new generation capacity under the CP RFP registered as a GRF on or after 1 January 2031, the emissions requirement has been incorporated into the Performance Conditions enforced by the Performance Bond. Should a genco fail to meet the emissions requirement during commissioning, such non-compliance will be subject to the applicable Performance Conditions and Performance Bond provisions under the relevant CP RFP.[5]

4.5 Under the Centralised Process framework, certain types of generation facilities are excluded from participation in the Centralised Process, while exemptions may be granted in limited circumstances.[6] Where EMA grants an exemption from participation in the Centralised Process, EMA will consider on a case-by-case basis whether the emissions requirement for that unit should be waived.

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[2] In the CP RFP, new generating units with a capacity of 100 MW or more, and repowered generating units involving a capacity increase of 100 MW or more, will be required to undergo the Centralised Process. This capacity threshold may be reviewed from time to time to ensure its continued relevance in meeting the objectives of the Centralised Process.

[3] For generating units procured under the CP RFP, this deadline corresponds to the Registration Date specified by EMA in the relevant RFP or Notice of Award.

[4] For the purpose of the commissioning test, 75% PLF refers to operating the generating unit at a constant load of 75% of its rated capacity throughout the testing period.

[5] Please refer to www.ema.gov.sg/calls-for-proposals/request-for-proposal-to-build-own-and-operate-new-generation-capacity-2026 for details of the Performance Bond drawdown for emissions non-compliance.

[6] Please refer to the paragraphs 13 and 14 of Final Determination Paper on the Centralised Process to Ensure Sufficient Generation Capacity for details on the categories of facilities excluded from, and circumstances under which exemptions may be granted from, participation in the Centralised Process.

Generating units under ancillary service contracts

4.6 In the draft Code, generating units that are deployed primarily to provide ancillary services such as fast start or black start would be required to comply with an annual emissions cap based on an emissions intensity limit of 0.355 tCO_2e/MWh at 50% PLF and a 30% hydrogen-readiness requirement. This was intended to limit emissions from less efficient technologies and reduce their impact on overall power sector emissions when operating commercially.

4.7 Under the revised approach, these units will not be subject to the emissions requirements as their operations are governed by contractual obligations under the ASC. These units can only operate as directed by the Power System Operator (PSO) to support system security and reliability during periods of tight supply or other system contingencies. As such, they should retain operational flexibility to respond to power system needs.

4.8 Where these units seek to operate commercially, they will require PSO's approval. EMA will assess at that juncture whether emissions requirements should be imposed on such units.

4.9 Similarly, these units will not be subject to mandatory hydrogen-readiness requirements, given their operating characteristics and intended role. Nevertheless, hydrogen-readiness will be preferred where technically and commercially achievable.

Embedded Generators (EGs)

4.10 In the draft Code, EGs were not subject to the emissions requirements but remained subject to the hydrogen-readiness requirement, with the flexibility to use alternative low-carbon fuels subject to EMA’s approval. This was intended to encourage the deployment of EGs capable of utilising hydrogen or other low-carbon fuels suited for industrial applications.

4.11 Under the revised approach, hydrogen-readiness requirements will be removed for EGs as well. EGs are primarily deployed to support the operational needs of industrial facilities. Their scale, operating characteristics and intended use differ from utility-scale generating units deployed to meet system demand. Removing these hydrogen-readiness requirements provides industrial facilities with greater flexibility in procuring EGs that best meet their operational needs. Industrial facilities are encouraged to continue exploring ways to reduce their emissions from EGs to manage their carbon tax liability.

4.12 Where an EG is otherwise subject to and seeks exemption from the Centralised Process, EMA will assess the circumstances of the case and determine whether compliance with the emissions requirement should be imposed as a condition of the exemption.

Emissions Testing Report

4.13 Generating units that are subject to emissions requirements shall undergo emissions testing as part of the commissioning schedules approved by PSO and shall submit the relevant emissions testing reports to EMA for assessment prior to GRF registration.

4.14 The emissions testing report shall include the emissions intensity, computed as the ratio of total greenhouse gas (GHG) emissions to total net electricity generation.[7] Throughout the testing period, the generating unit shall be operated at a constant 75% PLF.

a. Gencos should quantify GHG emissions (i.e. CO_2, CH_4 and N_2O) using a methodology consistent with the quantification approach under the Carbon Pricing Act (CPA).

b. Total net electricity generation refers to the electricity generated over the testing period. The emissions testing shall be conducted over a continuous period of at least one hour, after accounting for the generating unit's auxiliary load consumption.

4.15 The report shall include measured half-hourly data on the net electricity generation during the testing period, as well as the emissions data used to calculate the emissions intensity. Where GHG emissions are determined by calculation rather than direct measurement, the report shall include the underlying activity data and relevant inputs used to quantify CO_2, CH_4 and N_2O emissions at the generating unit level. EMA will provide further details on the reporting format and submission arrangements for the emissions testing report.

~ End

[7] Please refer to https://www.ema.gov.sg/consultations/emission-standards-for-power-generation-units for the calculation of emissions intensity for generation units subjected to the Centralised Process.