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DECISIONS OF OTHER IMO BODIES

Comments on proposed amendments to MARPOL Annex VI and the NO_x Technical Code 2008 covering the use of gas-fuelled engines as a tier III NO_x control strategy

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SUMMARY

Executive summary: This document comments on document MEPC 67/7/6, as referred to PPR 2, which proposed a number of amendments to the text of MARPOL Annex VI and the NO_x Technical Code 2008 related to use of gas fuels as a tier III NO_x compliance route. A review of existing requirements concludes that all but one of the points raised by that document are already addressed by those instruments and that one point could be resolved by a single addition to the NO_x Technical Code 2008 which would uniformly cover the change-over of all engines certified to both tier II and tier III

Strategic direction: 7.3

High-level action: 7.3.1

Planned output: No related provisions

Action to be taken: Paragraph 14

Related documents: MEPC 67/7/6; MEPC 65/4/7; resolutions MEPC.176(58), MEPC.177(58) and MEPC.251(66)

Introduction

1 This document is submitted in accordance with paragraph 6.12.5 of the Committees' Guidelines (MSC-MEPC.1/Circ.4/Rev.3) and comments on document MEPC 67/7/6 as referred by MEPC 67 to PPR 2 for consideration.

NO_x emissions of gas-fuelled engines

2 Document MEPC 67/7/6 in paragraph 1 states that "...LNG engines...also achieve the Tier III limits ...". However, as highlighted in the final report of the Correspondence Group on Tier III Technological Developments (MEPC 65/4/7, paragraphs 63 to 71), this is only where the gas fuel is introduced into the engine pre-mixed with the charge air (Otto cycle

engines). Where the gas is injected directly into the combustion chamber (Diesel cycle engines), NO_x emission levels tend to be reduced, as compared to the use of liquid fuel only, but not generally to tier III levels. Furthermore, as the report also mentions, even where gas fuel is used in pre-mixed combustion, tier III levels will not automatically be achieved.

3 Therefore the use of a gas fuel (e.g., natural gas – supplied to the ship and stored in a liquified or compressed state – or liquified petroleum gas), "fuel switching", does not in itself assure Tier III NO_x emission levels. Rather it is the changed nature of the combustion process in which it is used, together with the design and adjustment of the engine itself, which results in achieving Tier III emission levels and hence, as a compliance option, differs fundamentally from the means of SO_x control given by regulations 14.1 and 14.4 of MARPOL Annex VI.

Certification of dual-fuelled engines in accordance with the NO_x Technical Code 2008

4 In paragraphs 6, 10.1, 11, 12, 13 and 17 of document MEPC 67/7/6, a proposed definition of the term "dual fuel" is given. Paragraph 12 stresses that such a "dual fuel" engine is not a dual-fuel engine by virtue of the simultaneous use of gas and liquid fuels, but rather by the fact that it is intended to operate in either "gas" mode (with or without liquid pilot or balance fuel) or "liquid" mode and is certified to at least one of the tiers of NO_x limits on either fuel.

5 This proposal to amend the term "dual fuel" from its established usage in MARPOL Annex VI and the NO_x Technical Code 2008 (NTC), and elsewhere, where it clearly refers to any engine in which gas and liquid fuels are used simultaneously, appears to stem from the understanding, paragraph 6, that such an engine can only be certified at the 100% liquid fuel condition. This understanding is not supported by a review of the existing NTC. Although paragraph 5.3.4 of NTC requires an engine which simultaneously uses gas and liquid fuels to be tested at the maximum liquid-to-gas ratio, that does not imply 100% liquid fuel. Paragraph 2.4.1.2 of NTC requires the technical file required for each certified engine to state the "...full range of allowable adjustments...". Therefore the applicant for engine certification is already permitted to limit the liquid fuel rate to, e.g. the pilot injection rate, which would then be used as the basis of the parent engine test undertaken pursuant to chapter 5 of NTC and hence the NO_x emission value entered at 1.9.6 of the EIAPP supplement. This point is further reinforced by reference to the NTC amendments given by resolution MEPC.251(66), where the corresponding paragraph (there numbered 5.3.6) reads "...the maximum liquid-to-gas setting certified", clearly indicating that it is the certified limit of that ratio which applies, not the maximum ratio at which the engine could mechanically operate. This situation parallels the widely used limitation on the advance of fuel pump timing as restricted by the limit set in the technical file, which will typically be less than the maximum advance at which the engine could operate. Furthermore, to describe, as proposed by document MEPC 67/7/6, an engine which uses a liquid pilot fuel as being operated with "gaseous" fuel, leads to potential confusion, as engines of this type have typically operated using only liquid fuel at loads somewhere below around 20% MCR in service in order to maintain stable combustion.

6 Where an engine, which can operate with gas and liquid fuels simultaneously, is certified to Tier III with a restricted liquid-to-gas ratio, such as the pilot injection rate, and that is a given, defined, limitation in the technical file, the NTC already permits this to be given as one mode of operation within the technical file with a liquid-fuel-only operating condition, achieving, e.g., Tier II, given as another mode of operation within the same technical file. In this case the IAPP and EIAPP supplements would be duly completed, showing both tier II and tier III compliance.

7 Therefore it is proposed that the term "dual fuel", as currently used in MARPOL Annex VI and the NTC since their 2008 revisions, does not now need to be formally defined in a manner which differs from its established and general usage, as the NTC already provides for engine certification at restricted liquid-to-gas fuel ratios.

Identification of the NO_x control strategy applied

8 Paragraphs 10.3 and 23 of document MEPC 67/7/6 propose changes to the IAPP supplement to indicate the tier III emission control strategy used and paragraph 21 comments on engine details to be given in the technical file. Regardless of whether an engine (gas-, dual- or liquid-fuelled) is certified to tier II and tier III or only to Tier III, the existing provisions of regulations 5.3.2 and 13.8 of MARPOL Annex VI and hence those of the NTC, which are common to all technology options, will apply – in particular those relating to the aspects covered by the technical file, paragraph 2.4.1 of NTC, which requires inclusion of full details of the NO_x-critical components and settings, together with the onboard NO_x verification procedure (ONVP) applied at surveys, or at port State inspections, to verify that the engine is operating in the condition appropriate to the tier as stated in 2.2.1 of the IAPP supplement and 1.9.5 of the EIAPP supplement. Where the entries in these supplements show the engine to be certified to more than one tier, the application of the ONVP as set out in the relevant section of the technical file will demonstrate which tier is being complied with and also whether the applied NO_x-critical components and adjustments of the engine, together with any other restrictions and limitations, are as required for that tier. As highlighted in paragraphs 2 and 3, the use of a gas fuel alone does not automatically result in meeting tier III emission levels and, as per paragraph 5, engines which normally operate on gas fuel with a liquid pilot fuel may well, at low loads, such as the 10% load in the D2 test cycle, be operating only on liquid fuel.

9 Regulation 13 of MARPOL Annex VI and the associated NTC do not specify the means of compliance, unlike in regulation 14; instead, the NO_x limits and the means by which survey and certification are to be undertaken are given. Consequently, in the case of NO_x control, it is inappropriate to indicate on the IAPP supplement a specific means, i.e. gas fuelling - but this comment is equally applicable to other technology options, by which it is intended to achieve tier compliance because, as highlighted above, gas fuelling in itself does not assure compliance. Compliance in service is only verified by application of the relevant ONVP. Therefore the supplement should not be changed as proposed to indicate the particular emission control strategy used, since this is covered far more completely by reference to the engine's certification as given in its technical file. This non-inclusion of the emission control strategy in the IAPP supplement would therefore be consistent with the decision at MEPC 67 that, where a NO_x-reducing device is fitted, it should not itself be recorded on the IAPP supplement. No provision exists for the record of this strategy on the EIAPP supplement, as it is an integral part of the engine's overall NO_x certification and hence must be considered within that total context.

Recording of Tier change in relation to ECA-NO_x entry or exit

10 Paragraphs 10.4 and 21 of document MEPC 67/7/6 propose, for engines which use a gas-fuel approach to meeting tier III, a specific additional log-book to record the change-over actions taken to move to or from a tier III operating condition on entry to, and on exit from, an emission control area designated under regulation 13.6 of MARPOL Annex VI (ECA-NO_x). For the parameter check method (in almost universal use as the ONVP), it is mandatory to maintain a record book of engine parameters in which all changes and adjustments to an engine's NO_x-critical components and settings are recorded – paragraphs 6.2.2.7 and 6.2.2.8 of NTC. Consequently an already established and detailed requirement exists to record those actions taken when changing an engine between its certified tier II and tier III conditions.

11 As proposed by paragraph 21 of document MEPC 67/7/6, regulation 14.6 of MARPOL Annex VI should be deleted and an additional paragraph added to regulation 18 of MARPOL Annex VI covering both fuel change-overs as they affect both NO_x and SO_x compliance. As neither regulation 13 of MARPOL Annex VI nor the NTC specify the means by which compliance is to be achieved, it is inappropriate to combine the issue of NO_x compliance when entering/exiting an ECA-NO_x with that of SO_x compliance when entering/exiting an ECA-SO_x. Whereas the timely change-over between two compliant fuel oils ensures SO_x compliance, as highlighted above, the change-over to use gas fuel does not in itself ensure tier III compliance. Additionally, regulation 13 of MARPOL Annex VI and the NTC are essentially technology option-neutral; however, the proposed new paragraph for the regulation addresses only the gas-fuel approach to tier III compliance. In fact the question of recording the change-over of engine components and settings prior to entering or after exiting an ECA-NO_x relative to the boundary is not solely related to the gas-fuel approach, but is instead common to all technology options, such as selective catalytic reduction and exhaust gas recirculation, and to all of the ONVP options given in the NTC.

12 Therefore, to avoid splitting the SO_x control requirements between regulations 14 and 18 of MARPOL Annex VI (the latter currently deals only with fuel oil supply aspects) and to retain the NTC as the sole regime in respect of NO_x, it is considered preferable, and clearer to the industry in general, that regulations 14 and 18 are not amended as proposed. Instead, the issue of tier change-over, for those engines so capable, relative to the ECA-NO_x boundary, should be addressed on a uniform basis applicable to all technology options within the NTC by adding a new paragraph to chapter 6 of the NTC:

"6.1.2 In those instances where an engine is certified to the emission limits given by both regulations 13.4 (tier II) and 13.5.1.1 (tier III) , the engine shall be put into its Tier III operating condition prior to entry into an emission control area as given in regulation 13.6 and not taken out of that condition until after exit from such an area as shown by the procedures applicable to the particular onboard NO_x verification procedure applied. Additionally, the date, time and position of the ship on which that engine is installed shall be recorded, as appropriate to the procedure used, when the change-over to the tier III condition was completed prior to entry to such an area or when the change-over from the tier III condition was commenced after exit from such an area."

Amendment to regulation 3 of MARPOL Annex VI

13 Paragraph 18 of document MEPC 67/7/6 proposes that a new paragraph be added to regulation 3 of MARPOL Annex VI to cover instances of restricted gas supply failure. Regulation 3 is currently worded in a very general manner to cover the widest range of possible scenarios. To extend it as proposed for one particular technology option related to one regulation would logically require all such possible scenarios to be detailed. Therefore it is proposed that regulation 3 should not be amended as proposed.

Action requested of the Sub-Committee

14 The Sub-Committee is invited to note the information provided, the proposals made in paragraphs 7, 9, 12 and 13, and to take action as appropriate.
