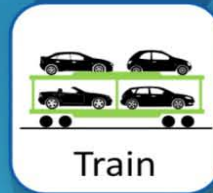




Sulphur Content in Marine Fuels



Briefing Report

November 2011



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Glossary

International Maritime Organisation (IMO): is the United Nations specialized agency with responsibility for the safety and security of shipping and the prevention of marine pollution by ships. In 1948 an international conference in Geneva adopted a convention formally establishing IMO (the original name was the Inter-Governmental Maritime Consultative Organization, or IMCO, but the name was changed in 1982 to IMO). IMO currently has 170 Member States and three Associate Members. Non-governmental international organizations that have the capability to make a substantial contribution to the work of IMO may be granted consultative status by the Council with the approval of the Assembly. At present 89 NGOs have Consultative status. IMO may enter into agreements of co-operation with other intergovernmental organizations on matters of common interest with a view to ensuring maximum co-ordination in respect of such matters. To date there are 61 intergovernmental organizations which have signed agreements of co-operation with IMO.

Marine Environment Protection Committee (MEPC): is one of the five main Committees of IMO and consists of all Member States; it is empowered to consider any matter within the scope of the Organization concerned with prevention and control of pollution from ships. In particular it is concerned with the adoption and amendment of conventions and other regulations and measures to ensure their enforcement (e.g. MARPOL). The MEPC was first established as a subsidiary body of the IMO's Assembly and raised to full constitutional status in 1985.

MARPOL (MARine POLLution) means the International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 relating thereto and by the Protocol of 1997. It currently includes six technical Annexes. A State to become a party to MARPOL must accept Annex I and II, as of today 151 States have ratified the first two annexes. Amendments of MARPOL are discussed and agreed upon by the MEPC.

MARPOL Annex VI: annex added to MARPOL in 1997 to regulate air pollution from ships.

Emission Control Area (ECA): a specially designated sea area where the adoption of special mandatory measures for emissions from ships is required to prevent, reduce and control air pollution from NO_x or SO_x and particulate matter or all three types of emissions and their attendant adverse impacts on human health and the environment.

Heavy fuel oil: any petroleum-derived liquid fuel, other than gas oil as defined below, which, by reason of its distillation limits, falls within the category of heavy oils intended for use as fuel and of which less than 65% by volume (including losses) distills at 250 °C by the ASTM D86 method. If the distillation cannot be determined by the ASTM D86 method, the petroleum product is likewise categorized as a heavy fuel oil.

Gas oil: any petroleum-derived liquid fuel, excluding marine fuel, of which less than 65 % by volume (including losses) distills at 250 °C and of which at least 85 % by volume (including losses) distills at 350 °C by the ASTM D86 method.

Marine fuel: any petroleum-derived liquid fuel intended for use or in use on board a vessel, including those fuels defined in ISO 8217 (1996), in particular:

Marine diesel oil: any marine fuel which has a viscosity or density falling within the ranges of viscosity or density defined for DMB and DMC grades in Table I of ISO 8217;

Marine gas oil: any marine fuel which has a viscosity or density falling within the ranges of viscosity or density defined for DMX and DMA grades in Table I of ISO 8217;

Note 1: ASTM method means the methods laid down by the American Society for Testing and Materials in the 1976 edition of standard definitions and specifications for petroleum and lubricating products;

Note 2: the definitions for the fuels are taken from the Directive 2005/33/EC that amends Directive 1999/32/EC;

Historical background about MARPOL and IMO regulations

The MARPOL Convention is the main international convention covering prevention of pollution of the marine environment by ships from operational or accidental causes. It is a combination of two treaties adopted in 1973 and 1978 respectively and also includes the Protocol of 1997 (Annex VI). It has been updated by amendments through the years.

The International Convention for the Prevention of Pollution from Ships (MARPOL) was adopted on 2 November 1973 at IMO and covered pollution by oil, chemicals, harmful substances in packaged form, sewage and garbage. The Protocol of 1978 relating to the 1973 International Convention for the Prevention of Pollution from Ships (1978 MARPOL Protocol) was adopted at a Conference on Tanker Safety and Pollution Prevention in February 1978 held in response to a spate of tanker accidents in 1976-1977. As the 1973 MARPOL Convention had not yet entered into force, the 1978 MARPOL Protocol absorbed the parent Convention. The combined instrument is referred to as the International Convention for the Prevention of Marine Pollution from Ships, 1973, as modified by the Protocol of 1978 relating thereto (MARPOL 73/78), and it entered into force on 2 October 1983 (Annexes I and II). In 1997 a new Protocol was adopted to add Annex VI.

The Convention includes regulations aimed at preventing and minimizing pollution from ships - both accidental pollution and that from routine operations - and currently includes six technical Annexes. Special Areas with strict controls on operational discharges are included in most Annexes. A State to become a party to MARPOL must accept Annex I and II. Annexes III-VI are voluntary annexes.

Annex I Regulations for the Prevention of Pollution by Oil (entered into force 2 October 1983, ratified by 151 States/Parties)

It covers prevention of pollution by oil from operational measures as well as from accidental discharges. The 1992 amendments to Annex I made it mandatory for new oil tankers to have double hulls and brought in a phase-in schedule for existing tankers to fit double hulls, which was subsequently revised in 2001 and 2003.

Annex II Regulations for the Control of Pollution by Noxious Liquid Substances in Bulk (entered into force 2 October 1983, ratified by 151 States/Parties)

Annex II details the discharge criteria and measures for the control of pollution by noxious liquid substances carried in bulk.

Some 250 substances were evaluated and included in the list appended to the Convention. The discharge of their residues is allowed only to reception facilities until certain concentrations and conditions (which vary with the category of substances) are complied with.

In any case, no discharge of residues containing noxious substances is permitted within 12 miles of the nearest land. More stringent restrictions applied to the Baltic and Black Sea areas.

Annex III Prevention of Pollution by Harmful Substances Carried by Sea in Packaged Form (entered into force 1 July 1992, ratified by 136 States/Parties)

Annex III contains general requirements for the issuing of detailed standards on packing, marking, labelling, documentation, stowage, quantity limitations, exceptions and notifications for preventing pollution by harmful substances. The International Maritime Dangerous Goods (IMDG) Code has, since 1991, included marine pollutants.

Annex IV Prevention of Pollution by Sewage from Ships (entered into force 27 September 2003, ratified by 129 States/Parties)

Annex IV contains requirements to control pollution of the sea by sewage.

Annex V Prevention of Pollution by Garbage from Ships (entered into force 31 December 1988, ratified by 143 States/Parties)

This deals with different types of garbage and specifies the distances from land and the manner in which they may be disposed of. The requirements are much stricter in a number of "special areas" but perhaps the most important feature of the Annex is the complete ban imposed on the dumping into the sea of all forms of plastic.

Annex VI Prevention of Air Pollution from Ships (entered into force 19 May 2005, ratified by 67 States/Parties)

The regulations in this annex set limits on sulphur oxide and nitrogen oxide emissions from ship exhausts as well as particulate matter and prohibit deliberate emissions of ozone depleting substances. Emission control areas set more stringent standards. It was prepared by the MEPC in 1990s and added to the MARPOL Protocol in 1997. It established:

- A global cap of 4.5% of sulphur in marine fuels;
- A lower limit of 1.5% of sulphur in SO_x Emission Control Areas (hereafter ECAs), in Europe the Baltic Sea was regarded as such (fully implemented in May 2006) ;
- To sets limits on emissions of nitrogen oxides (NO_x) from diesel engines. A mandatory NO_x Technical Code, which defines how this shall be done, was adopted by the Conference.
- Deliberate emissions of ozone depleting substances, which include halons and chlorofluorocarbons (CFCs), are prohibited. New installations containing ozone-depleting substances are prohibited on all ships. But new installations containing hydro-chlorofluorocarbons (HCFCs) are permitted until 1 January 2020;
- the incineration onboard ship of certain products, such as contaminated packaging materials and polychlorinated biphenyls (PCBs), is prohibited;

The MEPC initiated the discussion of strengthening Annex VI with additional amendments in July 2005. The North Sea was adopted as SO_x Emission Control Area at that time, the entry in to force date on this amendment was 22 November 2006 with full implementation 12 months later.

The MEPC agreed on the need to undertake a review of Annex VI and the NO_x Technical Code with a view to revising the regulations to take account of current technology and the need to further reduce emissions from ships. Between

2005 and 2007 a sub-Committee carried out the reviewed focusing in particular on available and developing techniques for the reduction of emissions of air pollutants and the potential for a reduction of NO_x and PM emissions.

The revised version of Annex VI was adopted in October 2008. To date 67 States/Parties have subscribed the revised MARPOL Annex VI.

Current situation from IMO standpoint

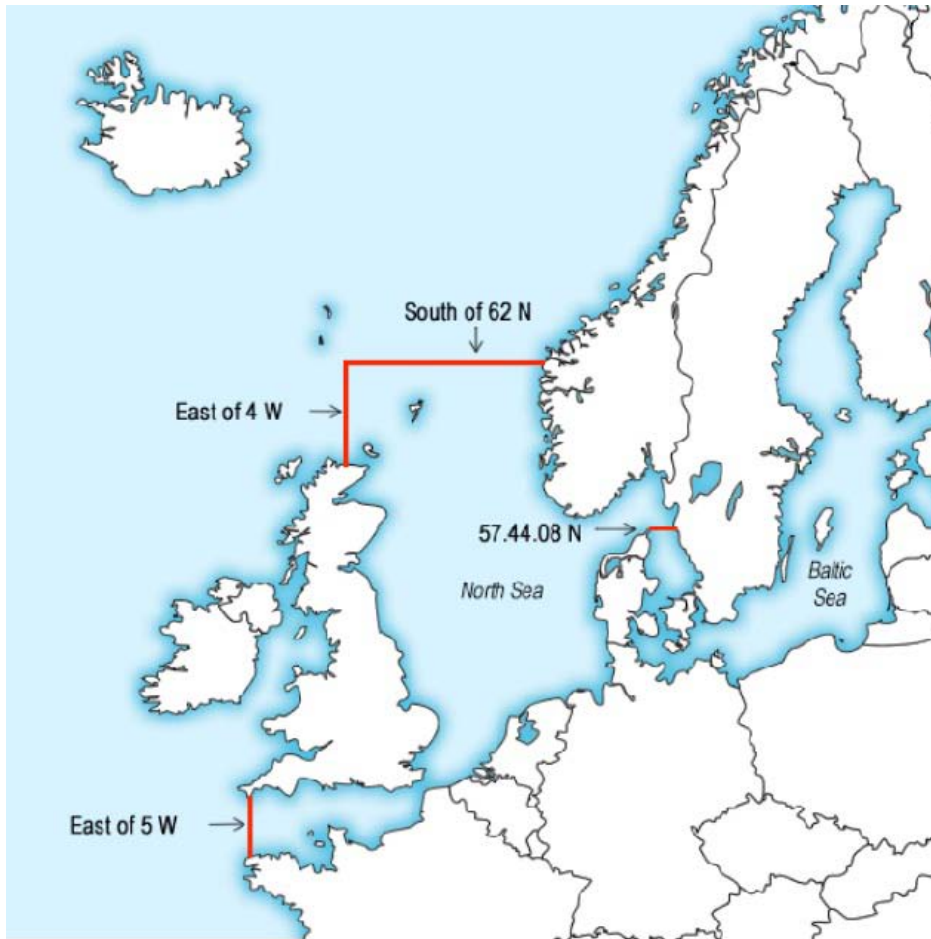
The limits for SO_x in fuel oil are subject to a series of step changes over the years:

Outside ECAs	Inside ECAs
4.5% prior to 1 January 2012	1.5% prior to 1 July 2010
3.5% on and after 1 January 2012	1.0% on and after 1 July 2010
0.5% on and after 1 January 2020*	0.1% on and after 1 January 2015

*depending on the outcome of a review by MEPC, to be concluded in 2018, as to the availability of the required fuel oil, this date could be deferred to 2025.

As of October 2010 the ECA established to limit SO_x and particulate matter emissions are:

- 1 Baltic Sea area - as defined in Annex I of MARPOL (see figure);
- 2 North Sea area (including the English Channel) - as defined in Annex V of MARPOL (see figure);
- 3 North American area (expected to enter into effect 1 August 2012); and
- 4 Puerto Rico and US Virgin Islands area (to be considered for adoption at MEPC 62nd meeting)



Most ships which operate both outside and inside these SO_x ECAs will therefore have to operate on different fuel oils in order to comply with the respective limits. In such cases, prior to entry into the ECA, it is required to have fully changed-over to using the ECA compliant fuel oil and to have onboard implemented written procedures as to how this is to be undertaken. Similarly change-over from using the ECA compliant fuel oil is not to commence until after exiting the ECA. At each change-over it is required that the quantities of the ECA compliant fuel oils onboard are recorded, together with the date, time and position of the ship when either completing the change-over prior to entry or commencing change-over after exit from such areas. These records are to be made in a logbook as prescribed by the ship's flag State, in the absence of any specific requirement in this regard the record could be made, for example, in the ship's Annex I Oil Record Book.

In Annex VI is also mentioned a fuel availability clause (Regulation 18). It requires that each subscribing State shall take all reasonable steps to promote the availability of fuel oils which comply with the limitations set in the Annex and inform the IMO of the availability of compliant fuel oils in its ports and terminals. It also grants a certain level of protection to the shipowners in the event of non-availability of compliant fuel oil.

There are other means by which equivalent levels of SO_x and particulate matter emission control, both outside and inside ECAs, could be achieved. These may be divided into methods termed primary (in which the formation of the pollutant is avoided) or secondary (in which the pollutant is formed but subsequently removed to some degree prior

to discharge of the exhaust gas stream to the atmosphere). The regulation in Annex VI allows for the application of such methods subject to approval by the subscribing State. In approving such equivalents an Administration should take into account any relevant guidelines. As of October 2010 there are no guidelines in respect of any primary methods (which could encompass, for example, onboard blending of liquid fuel oils or dual fuel (gas / liquid) use). In terms of secondary control methods, guidelines (MEPC.184 (59)) have been adopted for exhaust gas cleaning systems which operate by water washing the exhaust gas stream prior to discharge to the atmosphere, in using such arrangements there would be no constraint on the sulphur content of the fuel oils as bunkered other than that given the system's certification.

Historical background on EU Directives

At European Union level there have been subsequent steps to regulate sulphur content in liquid fuels to reduce its emissions in the atmosphere during the past twenty years.

Directive 93/12/EEC of 23 March 1993 established lower limits for the sulphur content in gas oil (definition on page 1 is from Directive 05/33/EC1 and do not include marine gas oil as was the case in previous directives) and new limits for aviation kerosene.

In the following years it has been deemed important to lay down limits for the sulphur content of other liquid fuels, in particular heavy fuel oils, marine fuels, marine gas oils and gas oils, on the basis of cost effectiveness studies and also in view of the regulation in Annex VI on sulphur content of marine fuel in the IMO's MARPOL Protocol of 1997. The result was Directive 99/32/EC of 26 April 1999 which amended Directive 93/12/EEC and established limits for sulphur content in heavy fuel oil (1.0% after 1 January 2003) and gas oil, including marine gas oil (0.2% after 1 January 2000 and 0.1% after 1 January 2008). In the latter case derogations for Greece throughout its territory, for Spain with regard to the Canary Islands, for France with regard to the French Overseas Departments, and for Portugal with regard to the archipelagos of Madeira and Azores were also included since the new limits may present technical and economic problems for these regions. In the Directive was also included a recommendation to continue the initiative to have the North Sea/English Channel declared as sulphur ECA.

Following the entry into force of MARPOL Annex VI in May 2005 a new Directive, 05/33/EC1, was promulgated in July 2005, amending Directive 99/32/EC. The measures in this Directive meant to complement Member States' national measures to comply with emission ceilings for atmospheric pollutants set out in Directive 01/81/EC. No impact assessment has been done by the European Commission since the Member States had already approved the new regulations as subscribers of the MARPOL ANNEX VI.

The Directive 2005/33/EC of the European Parliament and of the Council of 6 July 2005, amending the Directive 1999/32/EC establish the following:

1. Exclusion of marine gas oil from the sulphur content limit established for gas oil (see definitions on page 1) and eliminated the derogation for Greece for gas oil from 1 January 2010
2. A 1.5 % limit for marine fuels used in sulphur ECAs and by passenger ships operating on regular services to or from EU ports in Member State's territorial seas, exclusive economic zones and pollution control zones. The

application dates are: 11 August 2006 for the Baltic Sea, 11 August 2007 for the North Sea (including English Channel), 12 months after entry into force for any other ECA, including ports, designated by the IMO

3. A 0.1% limit for marine fuels used by inland waterway vessels and by ships at berth in EU ports as from 1 January 2010. This limit does not apply:
 - (a) whenever, according to published timetables, ships are due to be at berth for less than two hours;
 - (b) to inland waterway vessels that carry a certificate proving conformity with the International Convention for the Safety of Life at Sea, 1974, as amended, while those vessels are at sea;
 - (c) until 1 January 2012 for the vessels listed in the Directive's Annex and operating exclusively within the territory of the Hellenic Republic;
 - (d) to ships which switch off all engines and use shore-side electricity while at berth in ports.
4. As an alternative to using low sulphur marine fuels meeting the requirements listed above, Member States may allow ships to use an approved emission abatement technology, provided that these ships:
 - continuously achieve emission reductions which are at least equivalent to those which would be achieved through the limits on sulphur in fuel specified in the Directive
 - are fitted with continuous emission monitoring equipment
 - document thoroughly that any waste streams discharged into enclosed ports, harbours and estuaries have no impact on ecosystems, based on criteria communicated by the authorities of port States to the IMO.
5. The limit of sulphur content for heavy fuel oil remains 1.0% since 1 January 2003.

Current situation from EU standpoint

The MARPOL Annex VI amendments in 2008 introduced requirements for lower sulphur content in fuels globally, but also more stringent limits in the Emission Control Areas. In order to ensure regulatory consistency the European Commission presented a proposal in July 2011 to amend Directive 05/33/EC1 aligning EU legislation with the latest IMO requirements. In addition, the alignment with the international standards will be accompanied at EU level by a set of dedicated measures, which are further elaborated in the Commission Staff Working Paper published on 16 September 2011.

The proposal includes the following:

1. Change the definitions for marine diesel oil and marine gas oil to:
 - a. **marine diesel oil** means any marine fuel as defined for DMB grade in Table I of ISO 8217 with the exception of the reference to the sulphur content;
 - b. **marine gas oil** means any marine fuel as defined for DMX, DMA and DMZ grades in Table I of ISO 8217 with the exception of the reference to the sulphur content;

2. Member States shall ensure that marine fuels are not used or placed on the market within their territory if their sulphur content exceeds 3.5 % by mass.
3. Member States shall ensure that gas oils are not used within their territory if their sulphur content exceeds 0.10 % by mass (this do not include marine gas oil).
4. Limits for sulphur content in marine fuels used in ECAs: 1.0% until 31 December 2014, 0.1% from 1 January 2015.
5. Limits for sulphur content in marine fuels used in Member States' territorial seas outside ECAs: 3.5% from 1 January 2012, 0.5% from 1 January 2020. The latter date could be changed to 1 January 2025 subject to assessment by the IMO of the availability of marine fuel to comply with the maximum sulphur content of fuel of 0.50%.
6. Limits for sulphur content in marine fuels used by passenger ships (including Ro-Pax) in Member States' territorial seas outside ECAs: 1.5% until 31 December 2019, 0.1% from 1 January 2020.
7. Removal of the derogation for Greek ships listed in the Directive Annex to the 0.1% limit for sulphur content in marine fuels for ships at berth in EU ports.

In summary the main differences on sulphur content in marine fuels between the latest IMO requirements and the EC proposal made in July 2011 are:

- the 0.1% limit for passenger ships (including Ro-Pax) which operates outside SO_x ECAs from January 2020.
- the lack of a fuel availability clause as determined by MARPOL Annex VI Reg. 18 (see page 7).

Future developments

The proposal made by the European Commission in July will need to be evaluated and approved by the European Parliament and the Council before becoming a European Directive.

New SO_x ECAs are expected to be adopted in the future based on certain criteria and procedures for designation of SO_x ECAs as given in MARPOL Appendix III to Annex VI (e.g. the Mediterranean Sea).

The IMO will perform a review (to be completed by 2018) to determine the availability of fuel oil to comply with the fuel oil standard set forth in MARPOL Annex VI. It shall take into account the following elements:

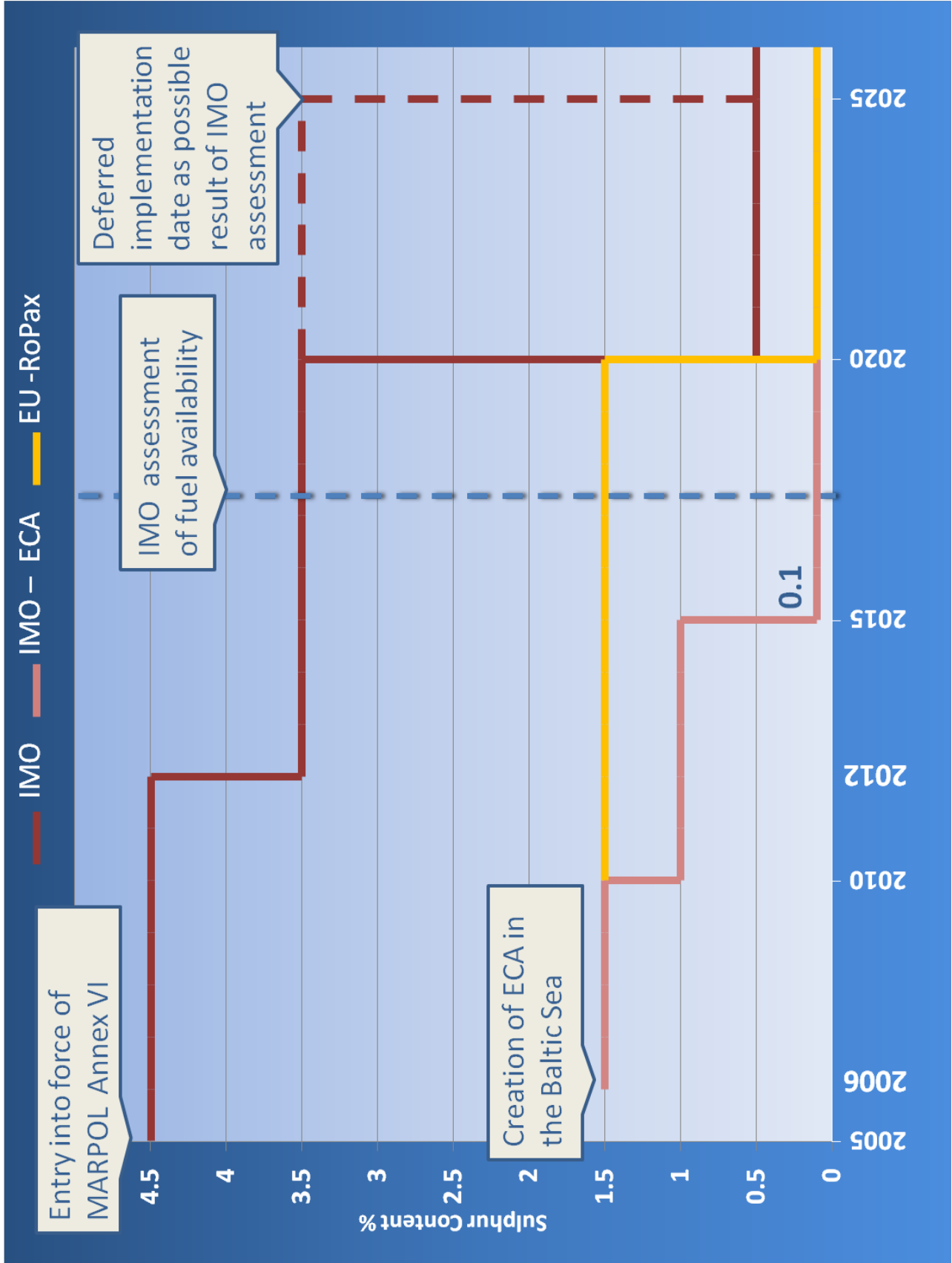
1. the global market supply and demand for fuel oil to comply with the sulphur limit that exist at the time that the review is conducted;
2. an analysis of the trends in fuel oil markets;
3. any other relevant issue.

Important deadlines and timeline

Sulphur Content Summary Table				
	2011	2012 →	2015 →	2020 →
Ships at berth	0.1%	0.1%	0.1%	0.1%
Inland waterways	0.1%	0.1%	0.1%	0.1%
Outside ECAs	4.5%	3.5%	3.5%	0.5% *
Inside ECAs	1.0%	1.0%	0.1%	0.1%
Ro-Pax (outside ECAs)	1.5%†	1.5%†	1.5%†	0.1%

*depending on the outcome of a review by MEPC, to be concluded in 2018, as to the availability of the required fuel oil, this date could be deferred to 2025.

†only in Member States' territorial seas as established by Directive 2005/33/EC.



Useful links

IMO: <http://www.imo.org>

ECSA: <http://www.ecsa.be/>

MARPOL Annex VI revised 2008:

[http://www5.imo.org/SharePoint/blastDataOnly.asp/data_id=23760/176\(58\).pdf](http://www5.imo.org/SharePoint/blastDataOnly.asp/data_id=23760/176(58).pdf)

European Commission proposal of amendment of Directive 1999/32/EC and Commission Staff Working Paper:

http://ec.europa.eu/environment/air/transport/ships_directive.htm

Directive 2005/33/EC1:

<http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2005:191:0059:0069:EN:PDF>

Directive 1999/32/EC:

<http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:1999:121:0013:0018:EN:PDF>

Directive 1993/12/EEC:

<http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:1993:074:0081:0083:EN:PDF>